Chapter IV

Alternative Economic and Energy Futures

The alternative economic and energy futures developed for this study are presented in this chapter along with a brief discussion of and a comparison with the Ford and Federal Energy Administration (Project Independence) studies completed in 1974. The alternatives in this chapter cover a wide range of possible futures including mild, moderate, and severe energy decreases and recession and depression economic conditions.

Having set the general context in Chapters II and III, this chapter introduces the assumptions of the future used in the study and presents these assumptions within the context of the two major energy studies. The development of these alternative economic and energy futures completes the first major task of the study, as described on page 7 in Chapter I, and provides a wide range of economic and energy forecasts, for which the effects on the transit industry are calculated. Chapter V examines the historical relationships between transit ridership and economic conditions (depressions and recessions) and then forecasts the effect on ridership of the economic futures presented in this chapter. Chapter VI explains the capacity of the transit industry and its capital goods suppliers to create employment opportunities and to respond to major changes in the transit program. Succeeding chapters estimate the effects of energy conditions on transit and forecast the effect of the energy and combined economic and energy futures on transit.

GENERAL FORECASTS

Although a number of forecasts have been made of projected energy demand, those of the Ford Foundation's Energy Policy Projects and the Federal Energy Administration's Project Independence represent the most frequently used and accepted. For purposes of comparison and to provide some perspective of the recent and forecast energy consumption levels, Table 9 summarizes gross energy resource consumption in 1972/73 and for the year 1985 (expressed in Quads-quadrillion Btu's per year),

As may be seen, both the Project Independence and Ford estimates are quite comparable, particularly when the difference in the base year is taken into account. These two projections are based on "historical growth" and "business-as-usual" concepts without any conservation effort. The Project Independence estimate shown in Table 9

TABLE 9

COMPARISON OF ENERGY DEMAND PROJECTIONS GROSS ENERGY RESOURCE CONSUMPTION 1972/73 - 1985

(In Quads)[1]

Estimating Group	Projected Demand 1972/73	1985	Compared Annual Growth Rate (1972/73-85)
Ford Study (1973)[2]	75.0	116.1	3.7%
Project Independence (FEA)[3] (1972)	72.1	109.1	3.2%

[1] Quadrillion Btu's per year
[2] "Historical Growth Scenario"
[3] "Business as Usual Without Conservation," $7 oil price

SOURCE: Ford Foundation, *Final Report*, by the Energy Policy Project, "A Time to Choose," Ballenger Publishing Company, Cambridge, Mess., 1974, page 21, table 1. Federal Energy Administration, *Project* Independence, Government Printing Office, November 1974, appendix 1 of 3, table P-5.

assumes a $7 per barrel oil price, but there are estimates in the study which include assumptions of $4 and $5 prices per barrel of oil. The consumption estimates shown in Table 9 were selected because they are based on assumptions roughly comparable to the Ford estimates and to the assumptions used in this study for the trend forecast. In terms of the future, the forecasts to 1985 are relatively similar, with compound annual growth rates over the period of 3,2 percent per annum for Project Independence and 3.7 percent for the Ford study.

In terms of the relative share for the various consumers of energy, both the Ford and Project Independence data indicate that the transportation sector consumes about **25** percent of total gross energy (in **1972** about **18.0** quads out of a total of ***72.1*** Quads). About 92 percent of the transportation sector's energy is from petroleum sources, re~ecting its dependence on petroleum fuel products.

The Energy Alternatives of the Ford and Project Independence Studies

The controlling factor in the Project Independ***ence*** analysis is the price per barrel of crude oil, All of the "effects" are derived from the assumed results of particular price levels with the analysis generally using $7 and $11 per barrel prices, and in some cases $4 (in effect, the price level for 1973) and $15.

Two basic strategies are considered independently and in combination. C)ne is acceleration of domestic supply by a number of means, all relatively well known. The other is energy conservation and demand management which assumes Federal regulation of major consumers (autos, power plants) and intervention in fuel mix consumed such as accelerating adoption of nuclear fuels. There are some proposals for handling supply emergencies, but they seem more pertinent for embargo situations and not longrun transit impact assessment. All of the fully developed comparisons include a "base case" referred to as BAU or "business as usual. "

The following comments from Project Independence summarize their perspective and viewpoint:

"- Rather than evaluate hundreds of alternative actions, the study contrasts the broad strategic options available to the United States:

— Increasing domestic supply,

—Conserving and managing energy demand,

—Establishing standby emergency programs.

"— The strategies are evaluated in terms of their impact on:

—Development of alternative energy sources,

— Vulnerability to import disruptions,

—Economic growth, inflation, and unemployment,

— Regional and social impacts.

"— The strategies are only illustrative, and in reality, a national energy policy will probably contain elements from each."[2]

The Ford Foundation study is more policy-oriented in its approach, and three energy scenarios are analyzed.[3] The first, "Historical Growth" (HG), is simply a continuation of the 1950-70 trend to 2000 supported by a vigorous program to maintain supply up to the level of demand, The second, "Technical Fix" (TF), assumes the use of already proven engineering techniques to control consumption, with a result that the rate of increase to the year 2000 is reduced by half (and the actual amount consumed per year by two-thirds). The third alternative, Zero Energy Growth (ZEG) analyzes the consequences of halting all increases in annual energy consumption by 1990 and involves some revisions in the economy. As stated in the report:

"Under the Historical Growth scenario there would be little scope to pick and choose among sources of supply, no matter what economic, foreign policy, or environmental problems they might raise. For example, no matter how we juggle the mix of sources, coal and nuclear power would have to be the mainstays of energy supply by the year **2000,** Together they would furnish more energy than all sources combined provided in 1973.

"Supply options are more flexible in the Technical Fix scenario. The slower growth in

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[1] Federal Energy Administration, Project Independence Report, Project Independence, Government Printing Office, November 1974, Appendix page 37, Table P-5.

'Federal Energy Administration, Project Independence Report, op. *cit.*, page 1.

[3] *Ford* Foundation Energy *Policy project, Final* Report," Time to Choose, Ballenger Press, Cambrige, 1974, pages 14-15.

TABLE 1O

ALTERNATIVE ENERGY AND ECONOMIC FUTURES SELECTED FOR ANALYSIS OF IMPACT ON TRANSIT INDUSTRY

Type of Alternative Future	*Assumed Conditions*
I. **Economic Conditions:**	
A. Recession	**Unemployment averaging 8% for 1975, 7% in 1976 and 6°/0 for the rest of the 5-year period. Duration-36 months peak to peak of the bueiness cycle (24 months decline, 12-month recovery).**
B. Depression	**Unernployment** averaging 9% **for 1975, 11% for 1976, 9% for 1977, 8% for 1978 through 1980.** Duration -48 **months peak to peak of the business cycle (30 months decline, 18-month recovery).**
ii. **Energy Conditions:**	
A. Decrease-Miid	**Decline in** total oil **Consumption of 1 million bbls/day by January 1976.** **Some *cuts in*** imports (cuts **of** 10-20% **of 1975 level of imports by January 1976). l977-80 growth in oil consumption: 3%/year.**
B. Decrease-Moderate	***Decline*** **in** total ***oil consumption*** **of 3 mNiion bbls/day by January 1977.** **Cut in Imports equal to 60-70% of the 1975 level of imports by January 1977. 1978-80 growth in oil consumption: 1.5%/year. .**
C. Decrease--Severe	Decline in total oil consumption of 6 million **bbls/day by January 1980.** **Imports cut equal to 100% of the 1975 level.**

SOURCE: Based on S.O.M./SyDec Work program prepared for prepared for OTA on December OTA on December 9, 1974, but revised for February Progress Report to reflect deepening recession and more pessimistic forecasts ssimiatic forecast generally being made by others, and further revised to reflect changing conditions and final needs of the study in April and May.

energy consumption permits more flexibility and a more relaxed pace of development. The Nation could halt growth in at least one of the major domestic sources of energy-nuclear power, offshore oil and gas, or coal and shale from the Rocky Mountain region-and still demand less from the other supply sources than Historical Growth requires.

"Zero Energy Growth would allow still more choice in supply from conventional sources. After 1985, this scenario could also permit use of a cleaner, renewable, but smaller scale energy sources such as windpower, roof-top solar power, and recycled waste to meet a larger share of the total energy demand. Still, it should be remembered that even in this scenario the national energy appetite would be very large. Even if there were no further annual growth in energy use after the 1980's, the Nation would still need to find enough supplies every year to meet an energy demand one-third larger than that of 1973. "[4]

Economic and Energy Futures Used in This Study

Table 10 summarizes the economic and energy futures which were used in this study to evaluate the effects of such futures on the transit industry,

The futures were selected to reflect a wide range of possible future conditions. The economic conditions included a recession which reflected most forecasts for the current recession.

[4]Ford Foundation Energy Policy Project, "A Time to Choose," pages 16-17.

The depression future assumed economic conditions would be worse than has been generally forecast. Energy futures ranged from a mild decrease of 1 million barrels/day over 1 year to a severe decrease of 6 million barrels/day reduction within 5 years. The mild decrease in energy availability is equal to the amount of the reduction during the energy crisis, but spread over the entire year of 1975. The severe cutback assumes a reduction by 1980 that is about equal to the current petroleum imports.

Comparisons Between Ford, Project Independence, and OTA Study

The purpose of the section that follows is to evaluate and compare the three OTA alternative energy assumptions in Table 11 with the energy assumption of the Ford and Project Independence reports. That will be followed by a similar evaluation and comparison of the economic assumptions.

In terms of time horizons, the Ford study uses only 1985 and *2000* as forecast years while Project Independence uses 1985 as well as 1977 and 1980, The time horizon for this study is *1980.*

In order to compare energy consumption among the alternatives, it was possible to convert all of the principal data to "Quads" (quadrillion Btu's consumed per year). This study's "severe" assumption target of eliminating the current level of imports, or reducing future *(1980)* availability by a rate of 6 million barrels of crude per day, under what it otherwise would be, amounts to about a 12-Quad reduction, Since each barrel of crude yields 45 percent gasoline (based on U.S. averages), the 12-Quad reduction overall would result in a gasoline reduction of about 5.4 Quads. This reduction is roughly equal to the effect on total transportation fuel for this "severe" alternative.

The 3-million barrel per day rate (proposed as the moderate alternative in Table 10) would, of course, amount to half, or a total of 6 Quads reduction from the trend, of which the transportation impact would be **2.7** Quads. The mild energy assumption of 1 million barrels per day reduction is about equal to what was actually accomplished in 1974 and seems to provide no analytical problems with respect to transportation,

In order to use relationships developed by the two major studies (Ford and FEA), it is necessary to locate comparisons which involved approximately similar amounts of reduction in energy consumption. For this purpose Table 11 was prepared, converting all data to quads. The "Total Fuels" category includes all direct use of fuels and excludes generation and consumption of electricity in all cases, "Transportation Fuels" are the amounts as proposed in each of the reported cases.

The comparisons in Table 11 show that the severe energy alternative of this study, eliminating the equivalent of all current levels of imports by *1980,* is more severe than any of the FEA energy alternatives but not as severe as the Ford Foundation's "Zero Energy Growth,"

Inspection of the differences among the FEA alternatives for the $7 per barrel price group shows that the maximum total fuels difference between *1985* forecasts is *–7.4* Quads and for transportation *–4.2* Quads. For the $11 price group the largest *1985* difference is *–6.5* Quads and for transportation *–3.3* Quads—all much smaller than the proposed differences of 12 and 5,4 Quads for this study. While larger differences could be found going between the extremes of the two FEA price groups, each price group analysis is internally consistent, and they are not bridged in the FEA work.

While none of the Ford scenarios would provide a precisely equivalent reduction in actual fuel availability, the difference of *10.5* Quads between the first two Ford scenarios—Historical Growth and Technical Fix—for *1985* is reasonably comparable to the difference of 12 Quads for this study. The total is lower, which might be interpreted to assume some increase in coal or nuclear fuels as offset—reasonably by *1985*—and the transportation difference is significantly higher (26.0 – 19.6 = *6.4* quads) than this study's "severe" reduction. This could be interpreted to imply a net transfer of petroleum to nontransportation uses, which would require strong conservation. Note that the Ford Foundation "Zero Energy Growth" scenario results in larger **1985** differences than our "severe" reductions for both total fuels and the transportation sector.

TAME 11

COMPARISON OF REPORTED ENERGY ALTERNATIVES FROM FEDERAL ENERGY ADMINISTRATION AND FORD FOUNDATtON

(Data in Quads: 1 Quad equals one quadrillion Btu's consumed per year)

Alternatives	1972 (FEA) 1973 (Ford)	1985	Diff 1972-3 to 1985
FEA-Project Independence			
$7.Barrel of Crude Price Scenario:			
a. Business as Usual Without Conservation:			
Total Fuels	53.5	68.1	14.6
Transportation Fuels	18.1	24.5	6.4
b. Business as Usual With Conservation:			
Total Fuels	53.5	61.2	7.7
Transportation Fuels	18.1	20.3	2.2
c. Accelerated Supply Without Conservation:			
Total Fuels	53.5	68.6	15.1
Transportation Fuels	18.1	24.5	6.4
d. Accelerated Supply With Conservation:			
Total Fuels	53.5	61.9	8.4
Transportation Fuels	18.1	20.4	2.3
$11/Barrel of Crude Price Scenario:			
a. Business as Usual Without Conservation:			
Total Fuels	53.5	63.7	10.2
Transportation Fuels	18.1	21.9	3.8
b. Business as Usual With Conservation:			
Total Fuels	83.5	*68.6*	5.1
Transportation Fuels	18.1	19.1	1.0
c. Accelerated Supply Without Conservation:			
Total Fuels	53.5	65.1	11.6
Transportation Fuels	18.1	22.4	4.3
d. Accelerated Supply With Conservation:			
Total Fuels	53.5	60.3	6.8
Transportation Fuels	18.1	20.0	1.9
Ford Foundation--Time to Choose			
Historical Growth Scenarlo:			
Total Fuels	58.8	*78.6*	22.8
Transportation Fuels	18.8	26.0	7.2
Technical Fix Scenario: - .			
Total Fuels	56.8	*68.1*	12.3
Transportation Fuels	18.8	*19.8*	0.8
Zero Energy Growth Scenario			
Total Fuels	55.6	65.2	9.4
Transportation Fuels	.18	18.4	0.4
1985 Differences:			
Historical Growth to Technical Fix—	Total—10,5 Transportation- 6.4		
Historical Growth to Zero Energy Growth—	Total—13.4 Transportation- 7.6		

SOURCE Ford Foundation Energy Policy Project, *op. cit.:* FEA, Project *Independence, op cit.*

ECONOMIC CONSEQUENCES

Turning to the economic consequences of energy conservation assumptions on the economy as a whole, one notes that both the Ford report and Project Independence have attempted to estimate the impacts on GNP, employment, and other economic variables, Project Independence concludes that the impact on the economy must be considered from both a short- and longrun viewpoint (similar to the conceptual view in the Ford study). The impact will differ depending on the time frame under consideration. Employment and growth impacts in the short run are likely to be more severe than in the long run. The Ford report differentiates between conservation impacts and disruption impacts (e.g., the embargo). The terms of reference of this study do not include evaluation of shortrun or disruption consequences, so major focus is on the longrun impacts. In this context, the Project Independence report notes that:

> "Conservation strategies reduce the demand for energy. Unlike the reduction in demand brought about by embargoes, there is no necessary relation between the institution of an ***energy*** conservation policy and real economic growth. To the extent that conservation reduces waste and to the extent that substitutes are available for the conserved resources, conservation strategies will not diminish real economic growth or employment. They would, however, lead to less pressure on the domestic environment and would reduce the rate of depletion of domestic resources."[5]

Table 12 summarizes the Project Independence forecast of annualized compound growth rates for GNP (1971 dollars), personal consumption and employment for the Base case at $7 and $11/bbl, and for the Accelerated Supply case at $11/bbl. Comparison of the differences in the growth in GNP over the period **1973-77, 1973-80,** and **1973-85** between the Base case and the Accelerated Supply case, with both at $1l/bbl, indicates there are no differences-annualized growth rates are **2.4, 2.8,** and **3.2** percent per annum for GNP for both cases for the three forecast periods respectively. The same situation prevails for personal consumption (also in 1971 dollars) and employment. There is obviously some difference for the $7/bbl case but the differences are significant primarily in the short run for GNP and personal consumption rather than for employment, The effects of the oil price differences tend to diminish in the long run even for GNP and personal consumption.

Though not strictly comparable, the Ford report arrives at similar conclusions, although as noted earlier, the basis for comparison of energy requirements differs from that of Project Independence. The Ford study uses an energy model developed by Data Resources, Inc. (DRI). The model is essentially a macromodel of U.S. economic growth activity into a single framework that is then used to project the general economic environment within which energy simulations are undertaken. Specifically, the macromodel is used to define prices and availability of capital and labor inputs and the total levels of final expenditures,

The energy analysis is based on an interindustry model of the U.S. economy in which production and consumption are treated as follows: production is classified into nine sectors (each represented by a production submodel); the nine production sectors purchase inputs of primary factors—imports, capital services, and labor services; the nine producing sectors also purchase inputs from each other; and the nine sectors then sell their net output to final users—personal consumption, investment, government, and exports.

These elements are all integrated within the interindustry model and transaction flows made consistent with respect to both final and intermediate demands. Of critical importance in the DRI model is the fact that patterns of input into the producing sectors as well as the final demand levels, are functions of, inter aJia, prices, The consequences of this is that the model allows for production to substitute (within the limits of given technical parameters) relatively less costly for relatively more costly inputs, In terms of the energy model, it permits producers and consumers to react to higher energy prices by economizing on energy uses through substitution of different fuels, by substituting between fuel and nonfuel purchases as well as cutting back on "nonessential" energy without accompanying substitutions.

The approach uses information about past production relationships as the basis for predicting future production changes in response to price changes but with the assumption of "reversibility"- i.e., that producers' reactions to the substantial declines in real energy prices in the past will apply, but in reverse, The Ford study suggests

[5] FEA, *Project* ***Independence,*** *op.cit.*, page 319.

TABLE 12

PROJECT INDEPENDENCE Annualized COMPOUND Rates OF GROWTH FOR GROSS NATIONAL PRODUCT, PERSONAL CONSUMPTION; AND EMPLOYMENT

		%11/bbl	
Groaa National Product[a]	$11/bbbl Base Case	Accelerated Supply	$7/bbl Base Case
1950-80	***3.2***	**d.n.a.**	**d.n.a.**
1960-70	**4.0**	**d.n.a**	**d.n.a**
1973-77	**2.4**	2.4	**4,6**[=]
1973-80	2.8	2.8	**3.8d**
1973-85	3.2	3.2	**3.7**[c]
Personal Consumption[e]			
1950-60	3.2	**d.na.**	**d.n.a.**
1960-70	***4.2***	**d.n.a.**	**d.n.a.**
1973-77	**2.4**	**2.4**	**3.9**[=]
1073-80	**2.9**	**2.9**	**3.6**[d]
1973-85	**3.2**	**3.2**	**3.4**[e]
Employment[b]			
1950-80	1.1	d.n.a.	**d.n.a**
1960-70	**1.8**	**d.n.a.**	**d.n.a.**
1973-77	**1.8**	**1.0**	**1 .9d**
1973-80	**1.7**	**1.7**	**1.8°**
1973-85	**1.5**	**1.5**	1 .5'

NOTE: d.n.a. means does not apply.

a,971 dollars
b Millions
c~Based upon 1974-78 Period
Based upon 1974-80 period
eBased upon 1974-85 period

8OURCE: FEA, Project *Independence,* report *op.* cit. page 320, Table VI.2.

that this is a conservative assumption because the behavioral adjustment is based on existing knowledge and in the future, new technology for conserving energy is likely to permit greater conservation than that predicted from historical relationships.

Within this framework, Table 13 summarizes the growth rates for GNP (1971 prices) and employment for the periods 1975, 1985, and 2000 for the three energy cases of Historical Growth (HG), Technical Fix (TF), and Zero Energy Growth (ZEG). Table 14 summarizes the differences in the respective growth paths, As ***r-nay be*** readily ***seen*** in Table 13, both the absolute and annual growth rate differences are small. The largest absolute difference between scenarios is in terms of GNP for the comparison between the HG and TF cases with TF's GNP in the year 2000 about 3,8 percent less than would occur under the HG energy growth assumptions in that **same year.**

In terms of annual growth rates for GNP, the differences **are very small** indeed as maybe seen in the section of Table 13 showing annual average growth rates with differences of only fractional rates: for example, only 0.1 percent per annum for the period 1975-85 and similarly for other scenarios.

For employment, the TF and ZEG cases show increases in employment greater than for the Historical Growth trend in the bottom half of Table 13 largely the result of substitution of labor for energy due to high energy prices.

TABLE 13

COMPARISON OF KEY ECONOMIC VARiABLES FOR HISTORIC GROWTH TECHNICAL FIX, AND ZERO ENERGY GROWTH IN FORD FOUNDATION STUDY

Economic Variables and *Energy* case	-Year8- 1976	1985	2000	Annual *Growth* Rates (% per annum) 1975-85	1986"2000	1975-2000
GNP (billion 1971 $)						
Historical Growth	**1 ,442.2**	**2,064.0**	**3,345.0**	**3.6**	**3.3**	**3.4**
Technical Fix	**1,442.2**	**2,030.0**	**3,218.5**	**3.5**	**3.1**	**3.3**
Zero Energy Growth	**1,442.2**	**2,030.8**	**3,226.7**	**3.5**	**3.1**	**3.3**
Employment (billion man hours)						
Historical Growth	**173.116**	**205.103**	**262.4557**	**1.71**	**1.66**	**1.70**
Technical Fix	**173.116**	206.949	266.546	**1.80**	**1.70**	1.74
zero Energy Growth	1?3.11 5	207.667	271.274	1.04	1.80	1.80

SOURCE: Ford Foundation Energy Policy Project, "A Time to Choose," *op. cit.*, Appendix F, Tables F-2, F-3, and F-6, pages 498, 502, and 506

TABLE 14

PERCENTAGE DIFFERENCE IN GROWTH BETWEEN THE THREE FORD STUDY SCENARIOS FOR BOTH GNP AND EMPLOYMENT

Variable	HG vs. TF		HG vs. ZEG		TF VS. ZEG	
	1985	2000	1985	2000	1985	2000
Real GNP	**-1.64%**	**- 3 . 7 8 %**	**-1.61%**	**-3.54%**	**0.03%**	**0.25%**
Employment	**0.30%**	**1.62%**	**1.25%**	**3.32%**	**0.35%**	**1 .77%**

SOURCE: Ford Foundation Energy Pollcy Project, A Time to Choose, OP. *cit.*, Appendix F, Tables F-2, F-3, and F-6, pages 438,502, and 508.

If the general characteristics of the Technical Fix case are used to represent this study's severe energy conservation case, based on the findings of both the Ford and Project Independence studies, the level of secondary economic impacts on the economy are not likely to be substantial in the long run.

However, the mix of output (and employment) is likely to be somewhat different as a result of the changes in energy availability. Table 14 summarizes the shares of output for six sectors as reported in the Ford study for 1985 and 2000 for all three scenarios. The only significant changes between scenarios forecast by the model are in the slight increase in the share of output for the service sector and the substantial decline in the energy sector,

In conclusion the Ford study states that "substantial reductions in U.S. energy input, compared to the Historical Growth energy demand patterns, can be secured without major economic cost in terms of reduced real output or reduced real incomes or increased inflation or reduced unemployment. "[6] This is based on the assumption that the factors of production will adjust to higher

[6] Ford Foundation Energy Policy Project Study, *A* Time To Choose, op. *cit.*, Appendix F, page 511.

energy prices in the long run-e. g., by 1985 and the year 2000. Over a period of 10 years, the scope for interindustry substitution is, of course, substantial. This does not, however, mean that there would be no repercussions or dislocations.

The Ford and Project ***Independence*** econometric models can only tell us what the result is in the terminal year of 1985 and 2000 (although Project Independence is somewhat more enlightening in this respect). However, the process of adjusting to changes in energy prices can cause disruptions, and the length and severity of these disruptions will depend on the extent to which, and how rapidly labor (capital, etc.) can be shifted to alternative resources. Neither model undertakes this analysis, although the ***Project Independence*** study did undertake analyses of the impact of the oil embargo. The results of that analysis are at least suggestive of the range of potential impacts, at least over the very short run.

The embargo impact studies were undertaken by the Department of Commerce (DOC) and Data Resources Incorporated (DRI), Because of other exogenous forces such as the already weak housing market, there was general agreement that there were important impacts from the embargo in terms of growth, unemployment, income distribution, and industrial output. Three overall conclusions were inferred from the DOC and DRI studies:

> "First, real output of the economy fell in the first quarter of this year about $10 to $20 billion, and the effect has been to put the economy on a growth path that is $10 to $20 billion lower than would have occurred without the embargo. The longrun implications of this estimated displacement of the growth path are uncertain, The estimates are based on quarterly economic models and the forecast errors for such models increase rapidly over time. Specifically, for periods greater than 2 years in the future, the forecast errors are larger than the estimated reduction in GNP. The embargo may have acted as an exogenous shock which caused a temporary downturn in the relevant economic variables. The longrun dynamic properties of the economy may not have been distributed, but given sufficient time, effects of the shock may dissipate. The point, however, is that we know little about the longrun implications of the embargo. "[7]

In terms of specific impacts, as might be expected, the repercussions were most serious on energy-dependent industries such as recreation, gasoline stations, airlines, and automobile and recreation vehicle manufacturing, etc. The Department of Labor estimated that for the period November ***1973*** to March 1974, 150,000 to 225,000 jobs were lost as a direct result of petroleum shortages, and an additional decline of about 310,000 jobs occurred indirectly. Thus, the total shortrun impact of the embargo on unemployment was a loss of about **500,000** jobs for about 0.5 percent of the civilian labor force.[8]

[7] Federal Energy Administration, Project Independence Report, op. cit., Appendix page 291.

[8] Federal Energy Administration, Project Independence Report, op. cit., Appendix page 297 ff.

TABLE 15

PERCENT DISTRIBUTION OF FORECAST OUTPUT 8Y SECTOR FOR DIFFERENT SCENARIOS IN THE FORD STUDY

	1985			2000		
sector	HG	TF	ZEG	HG	TF	ZEG
Agriculture	9.1	9.2	8.7	8 7	8.9	8.8
Manufacturing	22.4	22.6	22.6	19.8		20.2
Transport	3.1	3.1	3.1	. 2.5	2.5	2.5
Services	49.4	50.1	50.2	50.0	51.5	52.2
Energy	4.9	3.8	3.7	5.7	3.0	2.5
Services of Durables	11.1	11.2	1 1 . 2	13.3	13.9	13.8
Total=_	100.0	100.0	100.0	100.00	100.0	100.0
Output— (billion 1971 $)	2,049.2	2,019.1	2,019.9	3,342.1	3,218.5	3,226.7

SOURCE: Ford Foundation Energy Policy Project, A *Time to Choose, op. cit.,* Appendix F, Tables F-2, F-3, and F-6, pages 498,502, and 508.