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# THE POTENTIAL IMPACT ON SOCIO-ECONOMIC GROUPS OF RISING ENERGY PRICES DUE TO THE KUWAITI CRISIS

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by

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## AUTHORS' NOTE

By the time this paper was prepared for publication in late January 1991, war had erupted in the Persian Gulf between the Iraqi and Allied Forces. This event is inconsistent with the assumptions made here under the Case II scenario incorporating the Iraqi-Kuwait oil price shock. In the Case II scenario, it was assumed that war in the Persian Gulf would be avoided. However, the world crude oil market reacted in a very unexpected way. The price of oil was expected to rise sharply immediately after the eruption of the war on January 16, 1991; instead, the spot market price of West Texas crude oil for delivery in March 1991 plummeted by more than \$10/bbl, to \$18.40/bbl. Since then, the price of the oil has stabilized within a narrow range, closing at \$21.14/bbl on February 4, 1991. This price is not far from the projected 1991 price of \$23.17/bbl under the Case II scenario discussed in this paper. Moreover, the focus of the paper is on long-run projections, which are not expected to be greatly affected by the near-term fluctuations in the price of crude oil. The long-run price of crude oil is expected to be determined by world oil demand and supply considerations. Thus, energy prices under the Case II scenario remain a probable outcome for the future, and the information and conclusions discussed in the paper remain valid and timely.

# THE POTENTIAL IMPACT ON SOCIO-ECONOMIC GROUPS OF RISING ENERGY PRICES DUE TO THE KUWAITI CRISIS

by

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## Introduction

The Iraqi invasion of the kingdom of Kuwait on August 2, 1990, triggered immediate increases in the world price of petroleum. With U.S. imports of petroleum and residential, commercial, and industrial consumption of petroleum products on the rise, these price increases are already evident in the U.S. The differential impact of these increases on poor and minority households raises significant and potentially long-term research and policy issues for various government agencies, including the U.S. Department of Energy.

The purpose of this paper is to provide a preliminary analysis of the nature and extent of the potential impact of Iraqi-induced petroleum price changes on majority, black, and Hispanic households, as well as on poor and non-poor households. As this paper is written, the U.S. is continuing the deployment of several hundred thousand troops, aircraft, naval vessels, and other equipment to the Persian Gulf. The objectives of this deployment are to deter Iraqi invasion of Saudi Arabia and to encourage Iraqi withdrawal from Kuwait. The outcome of these initiatives, particularly the response of the government of Iraq, could stimulate additional changes in world petroleum prices and subsequent impacts on the household energy consumption and expenditure patterns of U.S. black, Hispanic, and poor households.

## Methodology

The first task in assessing the Iraqi petroleum-price effect is to use the Minority Economic Assessment Model (MEAM) to investigate the relationships between energy consumption and economic welfare for majority and minority, and poor and non-poor, households in the U.S. The model, developed by Argonne National Laboratory (ANL) for the U.S. Department of Energy (DOE) [1], provides a framework to prepare forecast estimates of energy consumption and expenditures for majority households, black and Hispanic households, and poor and non-poor households. The welfare implications of the revealed consumption patterns, by households, are also forecast. MEAM is a budgeting model based on a three-stage linear expenditure system. Structural parameters have been estimated using a longitudinal sample consisting of about 5,000

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observations from four Residential Energy Consumption Surveys (1980, 1982, 1984, and 1987) conducted by DOE [2-5].

## Case I

This base-case energy forecast is based on macroeconomic and energy variable forecasts obtained from Data Resources, Inc. (DRI) [6]. Figure 1 shows the cost of imported crude oil under this scenario. As the gap between the world oil demand and supply narrows during the 1990s, the crude oil prices are forecast to rise, first moderately in the first half of the 1990s and then at a double-digit rate in the second half of the 1990s. Figure 2 shows the rates of increase of selected key economic variables used in MEAM from 1989 to 1999 (in terms of average annual rates over the preceding two-year periods). As can be observed, the nominal household income is forecast to increase at a higher rate than the rate of inflation as measured by CPI, which in turn will be higher than the escalation in electricity rates, throughout the 1990s. However, the escalation in the price of nonelectricity fuels will cross the escalation rate of electricity prices in 1991, CPI in 1992, and income in 1993. Some of the Case I variable projections are shown in Table 1. The historical values were also obtained from DRI [7].

The forecast time horizon was broken into two periods: 1989-1993 and 1994-1999. Essentially, these periods could be considered intermediate and long-run, respectively. The DRI estimates were used to represent the base case prevailing for the entire period between 1990 and 1999.

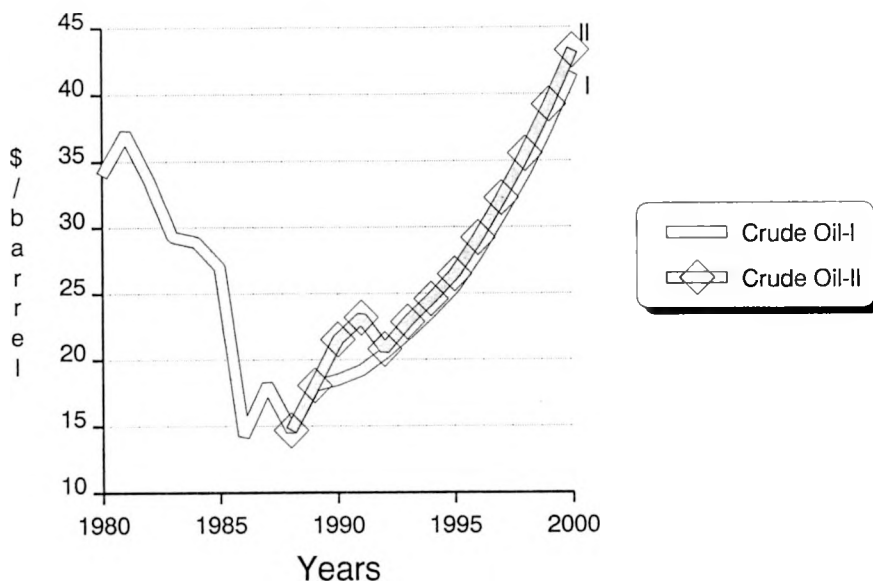


FIGURE 1 Imported Crude Oil Prices under Alternative Cases

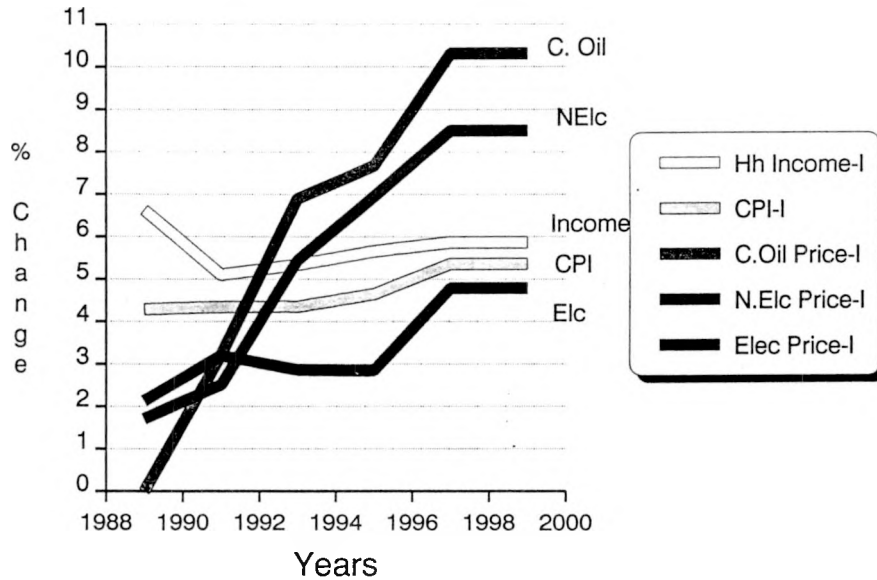


FIGURE 2 Key Economic Variables under Case I (annual rates of change over the preceding two-year periods)

TABLE 1 Case I, Annual Rates of Change in Key Macroeconomic and Energy Variables: 1989-1999

Variable	Percent Change	
	1989-93	1993-99
Household Income	5.22	5.81
Consumer Price Index	4.33	5.16
Electricity Price	3.04	4.23
Nonelectricity Price	3.97	8.06

Source: Refs. 6 and 7.

## Case II

This "special" case, referred to as "Case II," is based on the Iraqi-Kuwait price shock. Case II was based on the DRI macroeconomic scenario "Control 0990" [8], released after the invasion of Kuwait in August 1990. This scenario incorporates DRI's expectation of the new crude oil price trajectory over the 1990-93 period (Fig. 1). This scenario assumes that war in the Middle East will be avoided. However, the embargo of Iraqi and Kuwait crude oil is likely to extend into mid-1991. Increased production by other OPEC members is expected to lead to a shortfall of just 1.5 million barrels per day below pre-invasion forecasts. This is expected to lead to an average price of \$28 per barrel in the fourth quarter of 1990. Oil prices will gradually

decline to \$20 per barrel by mid-1992, as markets calm down, and then slowly firm to the base-case projection of \$23.50 by late 1993. It is then assumed that the forecast of the four variables given previously in Table 1 will be the same under both scenarios (Case I and Case II) for the period 1994-1999. The variable forecasts for the entire period (1989-99) are shown in Table 2. It must be stressed that these values of crude oil prices are subject to large variations that can result amid uncertainty about developments in the Middle East.

TABLE 2 Case II, Annual Rates of Change in Key Macroeconomic and Energy Variables

Variable	Percent Change	
	1989-93	1993-99
Household Income	4.73	5.81
Consumer Price Index	4.42	5.16
Electricity Price	3.15	4.23
Nonelectricity Price	6.55	8.06

Source: Refs. 8 and 6.

## Household Economic Effects of Alternative Cases

### Total Energy Consumption

Table 3 shows 1989 household energy consumption estimates for majority, black, Hispanic, poor, and non-poor groups. Among these groups, total energy consumption was highest for blacks, 112 million British thermal units per household ( $112 \times 10^6$  Btu/household), and lowest for Hispanics,  $88 \times 10^6$  Btu/household.

Figures 3-7 show forecasts of household electricity and nonelectricity consumption for the above-named groups under Case I. As shown in Table 1, the prices of nonelectric fuels (primarily natural gas and fuel oil) escalate faster than the price of electricity. For all households, there is a decline in nonelectric energy consumption and a less than offsetting increase in electricity consumption, which leaves each group's total energy consumption slightly lower (Figs. 8 and 9). This conservation in total annual energy consumption from 1989 to 1999 is minimal for poor households (5%) and maximal for non-poor households (8%).

Under Case II, the gap between the nonelectricity and electricity prices is forecast to be higher than the gap under Case I (Tables 1 and 2). On a comparative basis, for each of the household groups, the nonelectricity consumption is lower under Case II compared with Case I; electricity use is slightly higher (less than offsetting) under Case II compared with Case I (Figs. 3-7). Thus, each group's total energy consumption is left slightly lower under Case II than

it would be under Case I (Figs. 8 and 9). Table 3 provides energy consumption estimates for each of the groups for selected years.

TABLE 3 Total Annual Energy Consumption ( $10^6$  Btu/household)

Group	Case I			Case II	
	1989	1993	1999	1993	1999
Majority	101.9	98.7	94.8	98.6	94.6
Black	111.7	107.7	103.8	107.6	103.8
Hispanic	88.4	85.4	82.5	85.2	82.4
Poor	91.2	88.3	86.5	88.3	86.5
Non-Poor	104.9	101.1	96.3	100.9	96.2

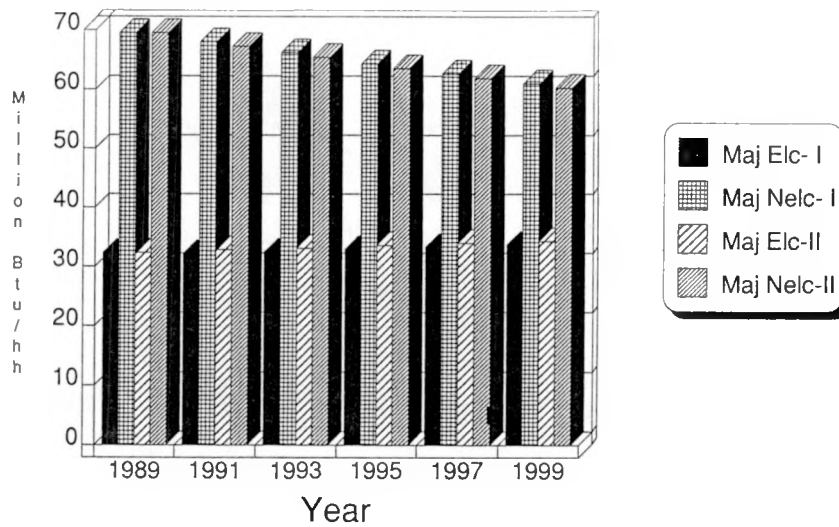


FIGURE 3 Majority Household Energy Consumption under Alternative Cases

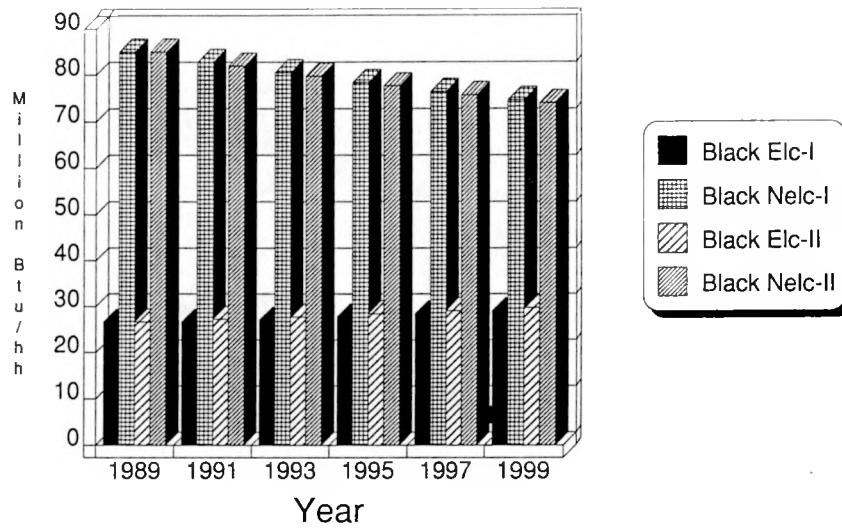


FIGURE 4 Black Household Energy Consumption under Alternative Cases

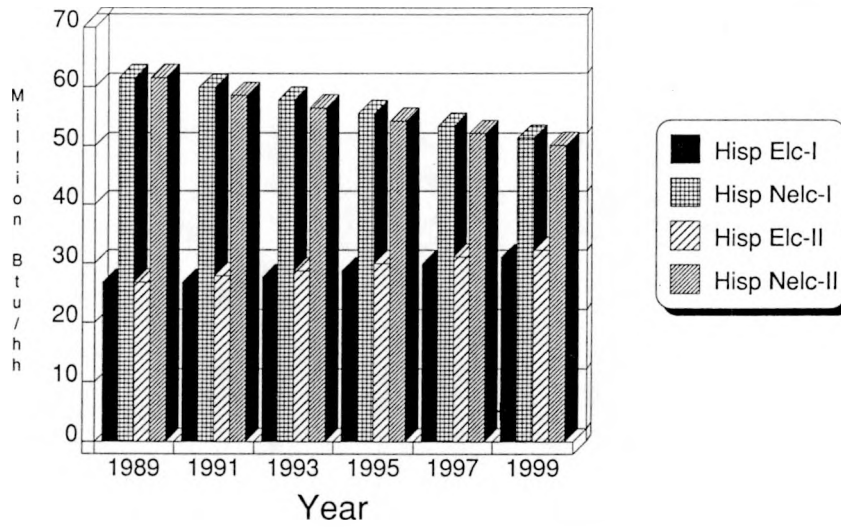


FIGURE 5 Hispanic Household Energy Consumption under Alternative Cases

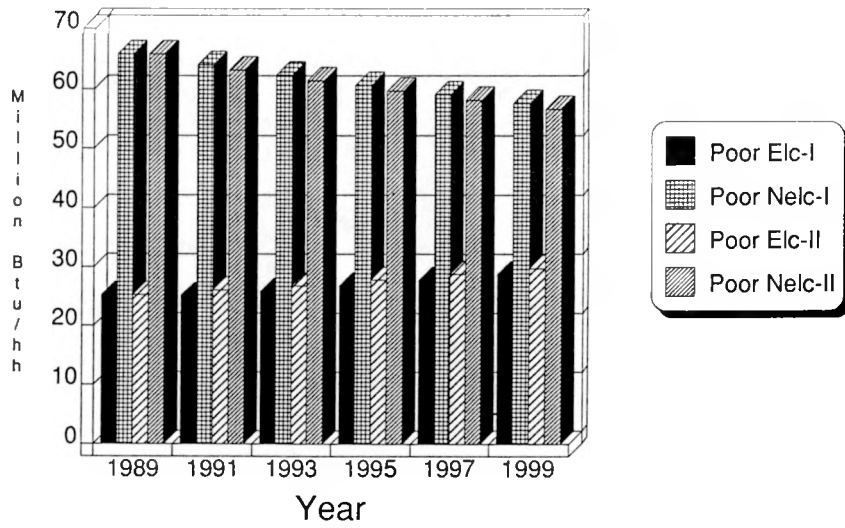


FIGURE 6 Poor Household Energy Consumption under Alternative Cases

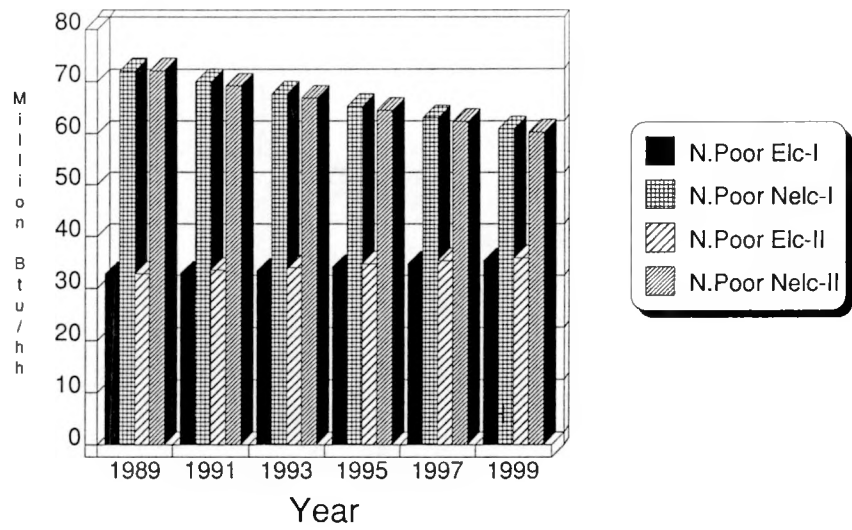


FIGURE 7 Non-Poor Household Energy Consumption under Alternative Cases

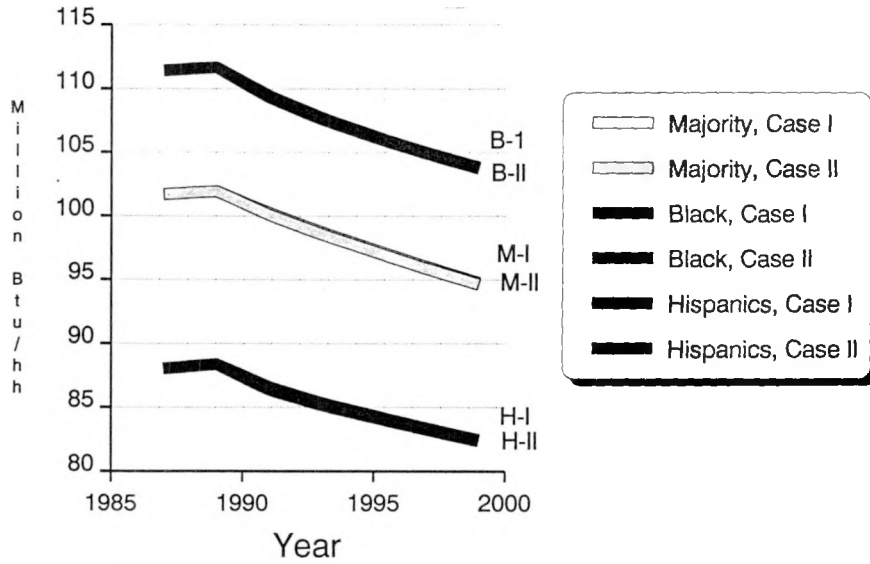


FIGURE 8 Energy Consumption of Majority, Black, and Hispanic Households under Alternative Cases

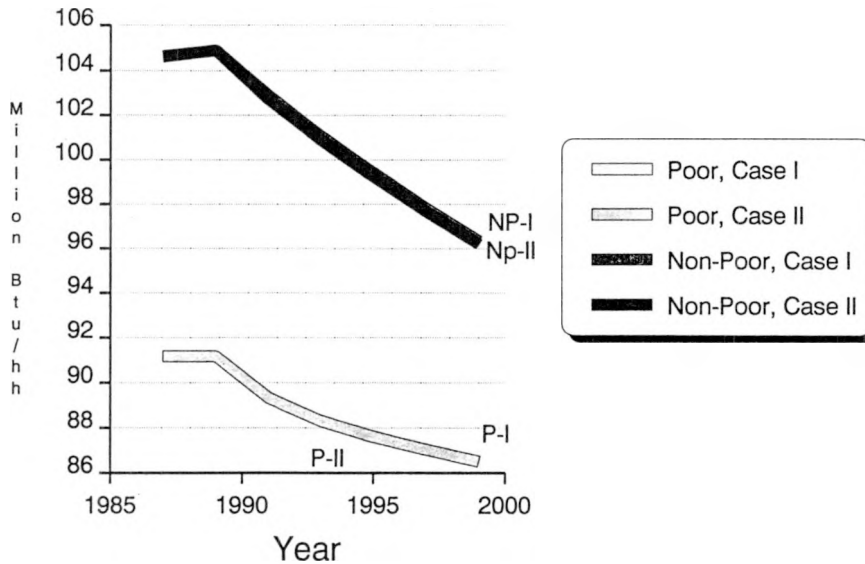


FIGURE 9 Energy Consumption of Poor and Non-Poor Households under Alternative Cases

## Total Energy Expenditures

Table 4 shows estimated 1989 household energy expenditures for majority, black, Hispanic, poor, and non-poor groups. Among these groups, total energy expenditure was highest for the non-poor group (\$1188/yr), with blacks a close second (\$1180/yr). The expenditures were lowest for the poor (\$988/yr).

TABLE 4 Total Annual Energy Expenditures (\$/household)

Group	Case I			Case II	
	1989	1993	1999	1993	1999
Majority	1154	1298	1780	1359	1864
Black	1184	1338	1891	1414	1997
Hispanic	1042	1186	1695	1252	1784
Poor	988	1122	1614	1188	1705
Non-Poor	1188	1341	1850	1403	1932

As might be expected, given the relative insensitivity of consumption with respect to rising energy prices, energy expenditures increase rather dramatically with time for each population group. Figures 10-14 show the projections of household electricity and total energy expenditures for majority, black, Hispanic, poor, and non-poor groups under the two cases.

The expenditures rise most for poor households between 1989 and 1999, 64% under Case I and 73% under Case II. This contrasts with the increase in consumer price index of 60% under Case I and 61% under Case II.

Table 4 provides energy expenditure estimates for each of the groups for selected years.

### Energy Expenditure as Share of Income

As shown in Fig. 2, under Case I, household income is forecast to increase at a higher rate than the rate of escalation of (1) electricity prices between 1989 and 1999 and (2) nonelectricity prices between 1989 and 1993. The percent of income spent on energy declines continuously from 1989 to 1995 for all groups (Figs. 15 and 16). A milder turnaround then begins. By 1999, the energy expenditure share of income for majority households is forecast to be only 0.33% short of the 1989 level, in contrast to 0.38% short for blacks, 0.19% short for Hispanics, 0.61% short for the poor, and 0.28% short for the non-poor. Under Case II, the above energy expenditure shares of income for each of the household groups turn up in 1991 before falling back in 1993 and 1995 (Figs. 15 and 16). This share then resumes an upward path for all groups. For the Hispanic and poor groups, the shares cross their 1989 levels in 1997 and continue to rise thereafter. By 1999, the shares are higher by 0.05% for Hispanics and 0.27% for the poor, compared with their 1989 levels. For blacks, the share in 1999 reaches its 1989 level. However, shares for the majority and non-poor groups only narrow the difference from their 1989 levels. Specifically, the majority households are forecast to be only 0.14% short of their 1989 levels, and the non-poor are short by only 0.10%.

Table 5 provides energy expenditure as share of income for each of the groups for selected years.

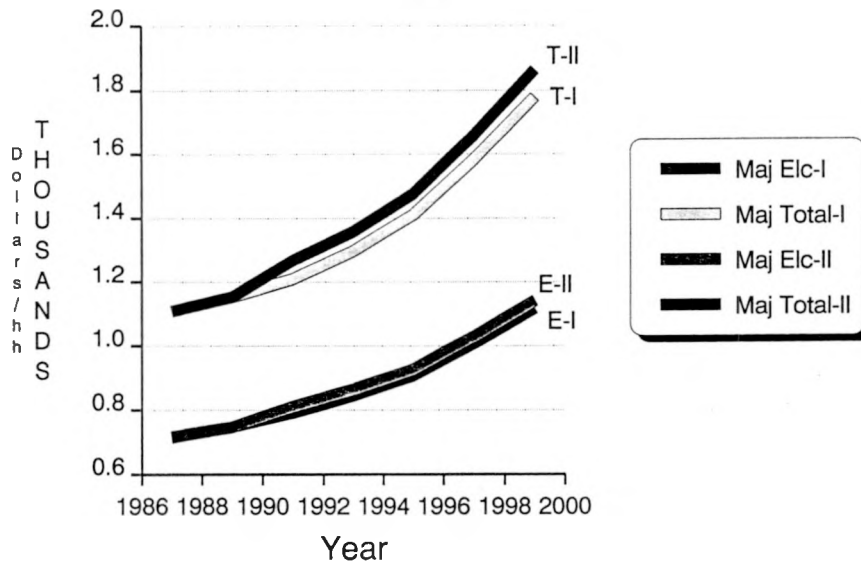


FIGURE 10 Majority Household Energy Expenditures under Alternative Cases

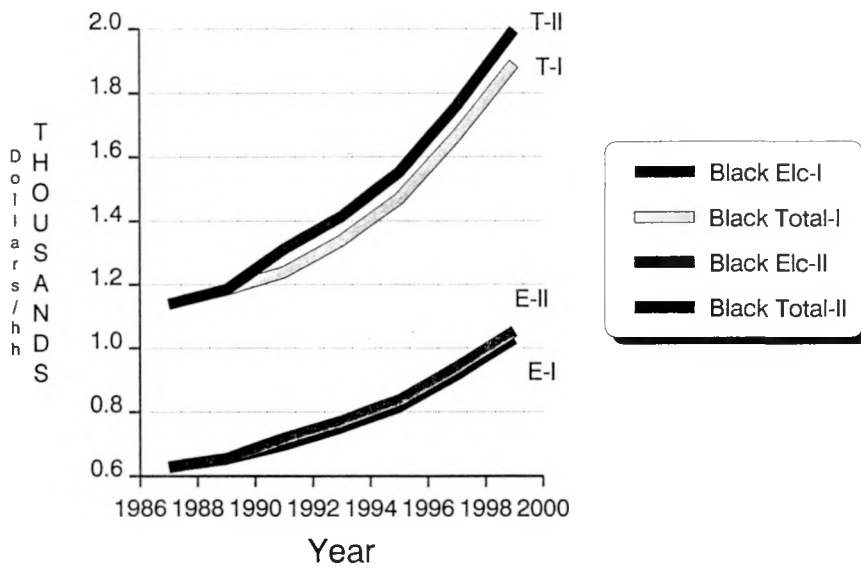


FIGURE 11 Black Household Energy Expenditures under Alternative Cases

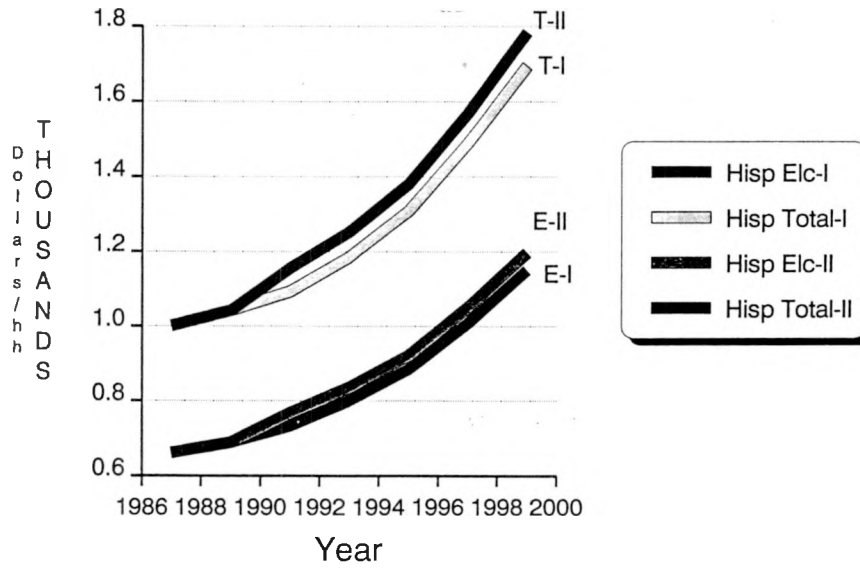


FIGURE 12 Hispanic Household Energy Expenditures under Alternative Cases

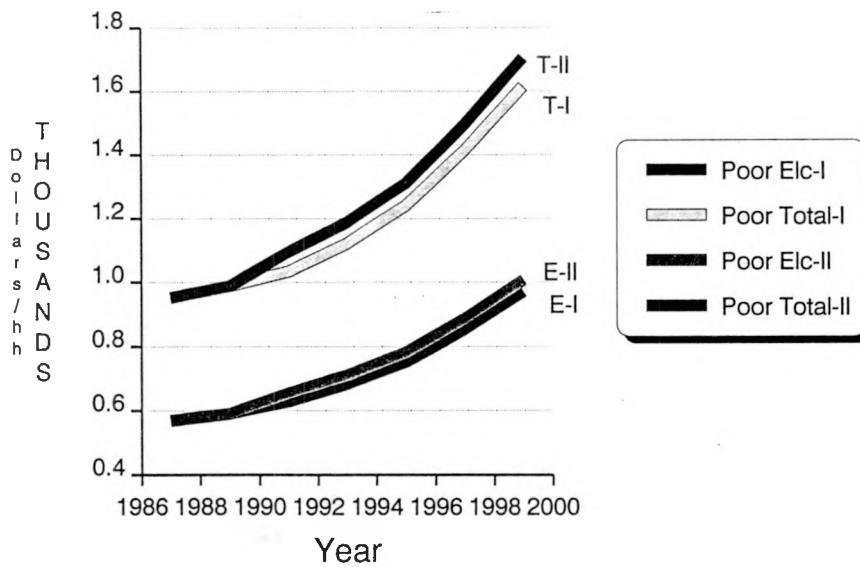


FIGURE 13 Poor Household Energy Expenditures under Alternative Cases

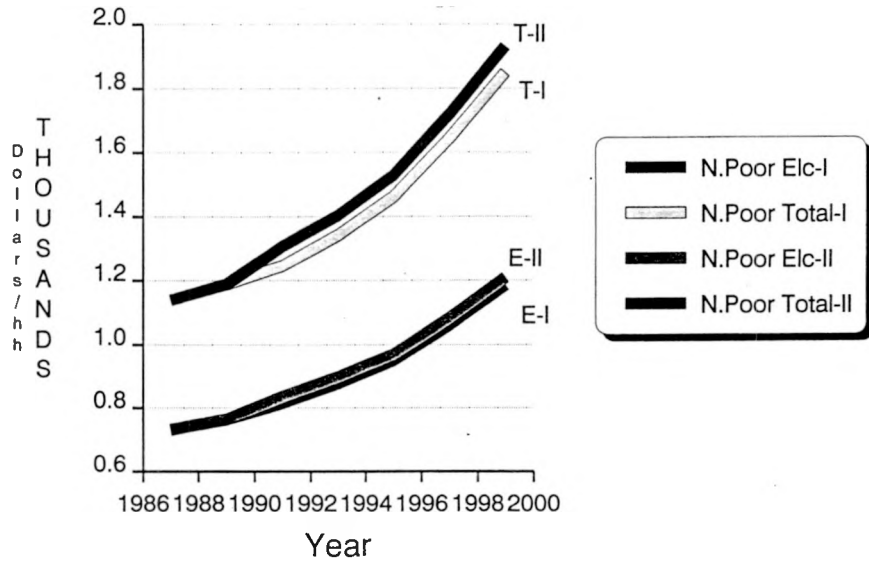


FIGURE 14 Non-Poor Household Energy Expenditures under Alternative Cases

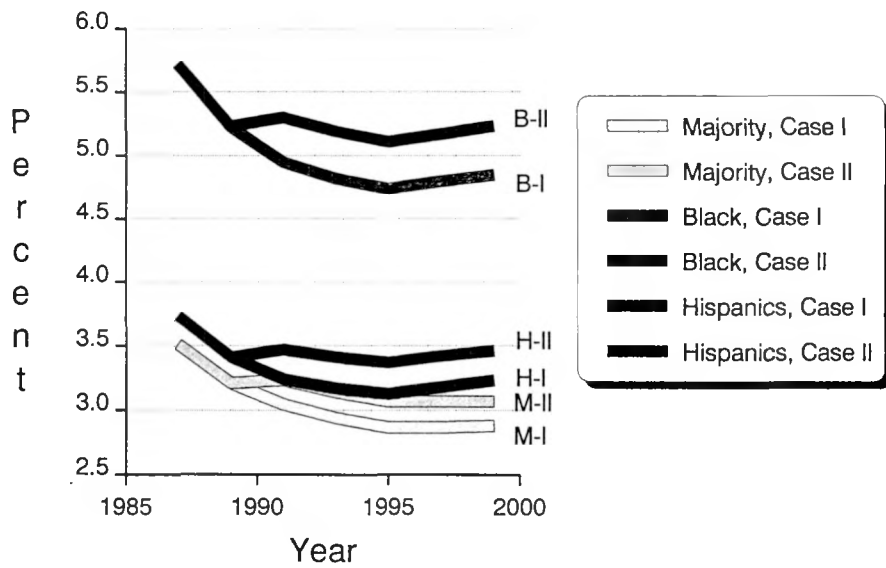


FIGURE 15 Energy Expenditure as Share of Income for Majority, Black, and Hispanic Households under Alternative Cases

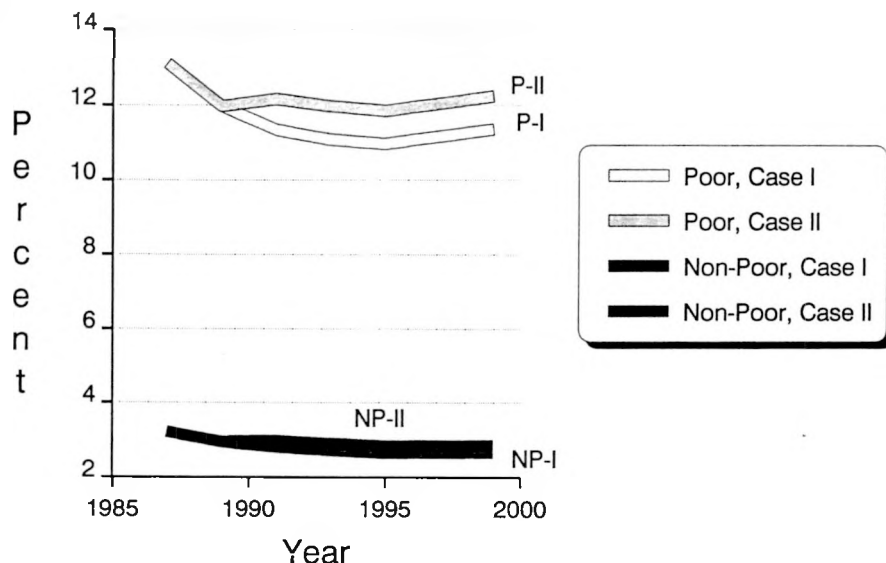


FIGURE 16 Energy Expenditure as Share of Income for Poor and Non-Poor Households under Alternative Cases

TABLE 5 Energy Expenditure as Share of Income (%)

Group	Case I			Case II	
	1989	1993	1999	1993	1999
Majority	3.21	2.94	2.88	3.14	3.07
Black	5.23	4.82	4.85	5.19	5.23
Hispanic	3.41	3.17	3.22	3.41	3.46
Poor	11.97	11.08	11.36	11.96	12.24
Non-Poor	2.96	2.73	2.68	2.91	2.86

## Conclusions

Several major conclusions can be drawn from the analysis. Among all household groups in 1989, (1) Total energy consumption was highest for blacks,  $112 \times 10^6$  Btu/household, and lowest for Hispanics,  $88 \times 10^6$  Btu/household; (2) total energy expenditure was highest for non-poor (\$1188/household), with black households a close second (\$1180) and poor households having the lowest expenditure (\$988); and (3) energy expenditure as share of income was highest for the poor, 12.0%, and lowest for the non-poor, 3.0%. Under both cases considered, the total energy consumption peaks in 1989 for all households. The decline in consumption during the 1990-99 period is lowest for poor households (5%). The energy expenditures rise most for poor households between 1989 and 1999, 64% under Case I and 73% under Case II. This contrasts with the increase in consumer price index of 60% under Case I and 61% under Case II. Under

Case I, by 1999, the energy expenditure share of income for majority households is forecast to be only 0.33% short of its levels in 1989, in contrast to 0.38% short for blacks, 0.19% short for Hispanics, 0.61% short for the poor, and 0.28% short for non-poor. Under Case II, the impact on this share is more severe than in Case I. By 1999, the share of majority households is forecast to be only 0.14% short of the 1989 level, and the non-poor share is short by only 0.10%. The share for blacks reaches parity with its 1989 level. The shares in 1999 are higher by 0.05% for Hispanics and 0.27% for the poor, compared with their 1989 levels.

These projections are based on the assumption that household income for each group grows at the same rate. Variations in the actual rates will affect both expenditure share and, to a lesser extent, energy consumption estimates. Because of this, the ultimate impact of changing energy prices on household economic welfare could be very different from what is projected here.

### Acknowledgments

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