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An Analysis of Residential Energy Consumption and Expenditures by Minority Households by Home Type and Housing Vintage

by

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ABSTRACT[1]

In this paper a descriptive analysis of the relationship between energy consumption, patterns of energy use, and housing stock variables is presented. The purpose of the analysis is to uncover evidence of variations in energy consumption and expenditures, and patterns of energy use between majority households (defined as households with neither a black nor Hispanic head of household), black households (defined as households with a black head of household), and Hispanic households (defined as households with a Hispanic head of household) between 1980 (time of the first DOE/EIA *Residential Energy Consumption Survey*, 1982a) and 1987 (time of the last DOE/EIA *Residential Energy Consumption Survey*, 1989a).

The analysis is three-dimensional: energy consumption and expenditures are presented by time (1980 to 1987), housing vintage, and housing type.

A comparative analysis of changes in energy variables for the three population groups - - majority, black, and Hispanic - - within and between specific housing stock categories is presented.

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PURPOSE

The purpose of this paper is to present a descriptive analysis of the nature of energy consumption and expenditures by three population groups -- majority (where the head of household is neither black nor Hispanic), black, and Hispanic -- by housing vintage and housing type over time.

The obvious has been recognized by a number of researchers (see Cowing and McFadden 1984; Dubin 1985; Green 1983) that housing and energy consumption are inextricably linked. With this is the recognition that energy consumption is moderately inert -- being closely linked to decisions made at the time of housing construction. It is proposed that the choice of housing type and location and the associated patterns of energy use reflect underlying historical and social processes (educational attainment, employment and housing patterns, and population migration) that have dominated the evolution of economic and social relationships between these groups.

It must also be emphasized that the following analysis is based on two relatively small cross-sectional samples. Therefore, the generalizations made are subject to error, with this being particularly true for Hispanics (in one of the cross-tabulated cells the number of observations on this group is only six).

The paper is organized as follows: in the next section, entitled "HOUSING DISTRIBUTION: 1980-1987," a descriptive analysis of the distribution of the three household groups by housing type and housing vintage will be presented. In the following section,

called "ENERGY CONSUMPTION AND HOUSING ATTRIBUTES," an examination of energy and electricity consumption, cross-tabulated by housing type and housing vintage for each, will be offered. In the next section, called "ENERGY EXPENDITURES VS HOUSING TYPE AND HOUSING VINTAGE", an analysis of levels and changes in real energy expenditures, cross-tabulated by housing type and housing vintage class, will be presented. In the final section, an attempt will be made to provide some tentative conclusions and some educated guesses on what the data reveals.

HOUSING DISTRIBUTION: 1980-1987

In Tables 1 and 2 are shown the household (DOE 1982a, and 1989a) population distributions for majority, black, and Hispanic households by housing type and housing vintage in 1980 (actually for the period between April 1980 and March 1981) and 1987. Generally, majority households live in single-family (single-family detached units) homes more often than either blacks or Hispanics and in multifamily homes less often.

For blacks there was virtually no change in the distribution of households by home type between 1980 and 1987. For Hispanics there was a sharp decline in the proportion of households living in single-family homes in the same period and increases in the proportion of households living in multifamily and other (single-family attached and mobile home) housing. The change in the majority household population distribution between 1980 and 1987 was similar to that of Hispanics. The percentage decrease in the number of majority households living in single-family homes and the percentage increase in number living in other housing were not as great as that of Hispanics.

When looking at the population distributions by housing vintage, it is seen that a large fraction of the majority household population live in newer homes, particularly compared to blacks. In comparison to Hispanics, a smaller proportion of majority households live in homes built before 1950.

In 1980, a larger fraction of Hispanics lived in homes built after 1974 than the majority, but in 1987 the proportion of

Table 1. Distribution Of Households By Housing Type 1980 and 1987 (%)

Housing Type	Majority	Black	Hispanic
Single family			
1980	67.2	48.9	59.4
1987	63.2	49.5	52.0
Difference	-4.00	0.60	-7.40
Multifamily			
1980	22.6	43.0	34.6
1987	24.6	43.8	37.3
Difference	2.00	0.80	2.70
Other			
1980	10.20	8.10	6.00
1987	12.20	6.70	10.70
Difference	2.00	-1.40	4.70

Source: DOE 1982a and 1989a

majority households living in homes built after 1974 grew dramatically. As a consequence, a larger proportion of majority households lived in homes built after 1974 than did Hispanics. The increase in the proportion of black households living in homes built after 1974 between 1980 and 1987 was significantly smaller than for the majority and as a consequence the gap in the proportion of majority and black households living in newer homes grew.

The relative change in population distribution over housing vintage seems to reflect the movement of population groups described by O'Hare et al (1982). In that study it was observed that the black population movement was similar to movement of the

Table 2. Distribution Of Households By Housing Vintage 1980 and 1987 (%)

Housing Vintage	Majority	Black	Hispanic
Built < 1950			
1980	35.7	51.1	40.9
1987	31.3	42.4	35.9
Difference	-4.4	-8.7	-5.0
1950 to 1974			
1980	49.7	41.6	43.5
1987	43.0	44.6	43.4
Difference	-6.7	3.0	-0.1
Built > 1974			
1980	14.5	7.3	15.6
1987	25.8	13.0	20.7
Difference	11.3	5.7	5.1

Sources: DOE 1982a and 1989a

general population but did not occur at the same rate. In that older homes are more often located in the central city and homes become progressively newer the further away you move from the central city, the disproportionate concentration of blacks in older homes and the disproportionate growth of minorities (particularly blacks) in single-family homes built between 1950 and 1974 seem to reflect the process observed by O'Hare and his colleagues in the decennial censuses.

The process, described by O'Hare et al, is characterized by a general population migration from the central city to the urban fringe and the suburbs, in which the majority population moves at

Table 3. Sample Size (#) and Distribution (%) of Households By Home Type and Housing Vintage: 1980 and 1987

	Single Family Detached								Multifamily							
Vintage	<1950		1950-1974		>1974		Total		<1950		1950-1974		>1974		Total	
Population Group	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Majority																
1980	1,360	25.4	1,786	33.6	429	8.2	3,575	67	423	8.4	470	9.9	191	4.2	1,084	23
1987	1,188	21.7	1,366	27.5	643	14.0	3,197	63	415	7.6	500	10.5	272	6.5	1,187	25
% Difference		-3.7		-6.1		5.8		-4		-0.8		0.6		2.2		2
Black																
1980	142	21.7	142	23.0	28	4.8	312	50	126	23.7	91	17.4	13	1.9	230	43
1987	197	20.0	173	23.2	51	6.1	421	49	201	19.9	187	19.1	39	4.7	427	44
% Difference		-1.7		0.2		1.3		-1		-3.8		1.7		2.8		1
Hispanic																
1980	49	19.2	67	28.3	27	11.2	143	59	38	19.3	30	12.6	6	2.7	74	35
1987	71	18.7	83	24.5	27	8.4	181	52	82	15.4	59	14.5	21	7.4	162	37
% Difference		-0.5		-3.8		-2.8		-7		-3.9		1.9		4.7		2

Sources: DOE 1982a, and 1989a.

a faster rate to the suburbs and nonmetropolitan areas from the central city and the urban fringe and is replaced in the urban fringe by minorities (in the context of O'Hare's discussion, minorities refer to blacks exclusively).

Table 3 serves a dual purpose. It first of all shows the percent of each population group falling within each cell by home type and home vintage. It also shows the number of observations for each population group within each cell and thereby gives some indication of the error associated with the estimates to be provided in subsequent tables.

The distribution of households by home type and home vintage are similar for the three population groups in both years, with the biggest difference seen in the distribution of households over housing vintage within the multifamily category. Once again a higher proportion of the household population lives in single-family homes -- with a higher concentration of the majority population living in this type of home. In the single-family home category, most of the households lived in units built between 1950 and 1974.

As expected, because of socioeconomic circumstances and the attendant distribution of households by region and location within the metropolitan area, the magnitude of the population proportions within each of the cells does differ. Mobility, wealth, and income differences (for some idea of the extent of these differences see DOC, 1991a; O'Hare, 1983; DOC, 1991b) contribute to the fact that majority households are disproportionately concentrated in newer

single-family homes, which are typically more expensive and located further away from the central city.

Changes in the housing type and housing vintage profiles for minority households were different and, between 1980 and 1987, occurred for different reasons than for majority households. With the exception of blacks living in multifamily homes built before 1950, the estimated household count (not shown in Table 3) in each cell for black and Hispanic households grew from 1980 to 1987. On the other hand, the estimated household count for the majority increased only in homes built after 1974 and in multifamily homes built between 1950-1974. Therefore, the change in population distributions between 1980 and 1987 for minorities was due more to differential rates of growth across cells, and for the majority, to shifts in population between cells.

Figure 1 presents a conceptual configuration of urban housing patterns. The evolution of existing housing patterns involves a two-tier process: the first tier represents a contemporaneous process in which better or more preferable (presumably single family) housing is built for higher income/managerial class households, and less preferable (presumably

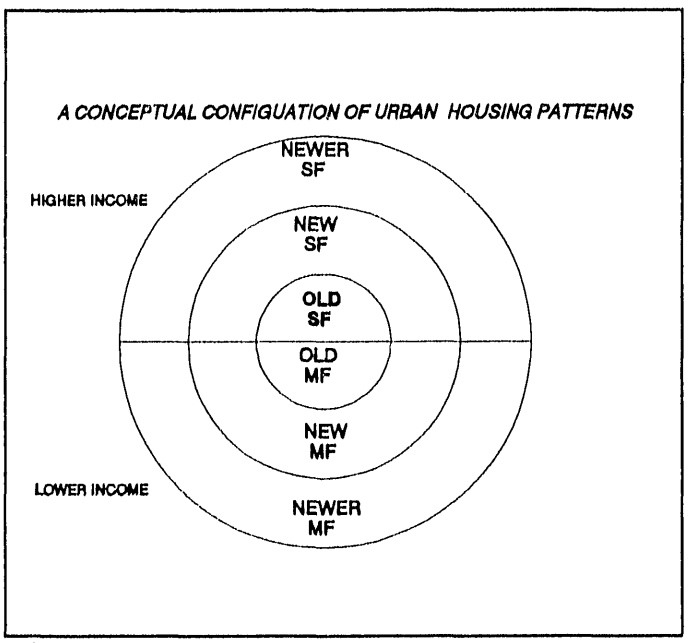

Figure 1

multifamily) housing for lower income/working-class households in approximately the same location. The second tier represents a temporal process in which there is a gradual movement outward from the central city, initially by higher income households, into newer single-family homes. This movement is followed by lower income/working-class households, who move into, in disproportionate numbers multifamily homes and who also move into older single-family homes vacated by higher income households.

Relative trends in housing pattern changes are more likely to be seen at the extreme ends of the process illustrated in Figure 1, with a more murky picture emerging with respect to single-family and multifamily houses built in the urban fringes (assumed to be dominated by homes built between 1950 and 1974). Therefore, within this conceptual context, it is expected that, over time, a disproportionate number of majority households (who are on the average wealthier and have higher incomes) will move into newer single family homes. It is also expected that there will be a disproportionate decline in the number of households living in old multifamily units and that there will be a disproportionate increase in the number of minorities living in older single-family homes.

Between 1980 and 1987, there was a slight fall in the proportion of households living in single-family homes for each of the population groups. The fall was, however, not uniform across housing vintages. For majority and black households, there was an increase in the proportion of households living in single-family

homes built after 1974. The increase was greater for majority households, as suggested by the model shown in Figure 1. Furthermore, the substantial proportional decline in majority households living in single-family homes built between 1950 and 1974 may reflect a migration of this group from the urban fringe further out to the suburban and nonmetropolitan areas. For Hispanics, there was a decline in the proportion of the household population living in single-family homes in each housing vintage class.

In multifamily housing, the proportion of each population group living in multifamily homes built before 1950 declines between 1980 and 1987. The decline was most dramatic for Hispanic and black households, conforming to the conceptual outline presented in Figure 1. The proportion of the household population living in multifamily homes built after 1950 grew for each group, with the biggest increase occurring for minority households. It should be noted that there was a relatively smaller decline in majority households living in multifamily homes built before 1950. This may be a manifestation of the so-called regentrification process, in which more affluent households relocate within the central city.

The changing residential panorama suggested by the data contained in Table 3 seem in fact to conform to the general ideas intimated throughout the literature (see Harris and Ullman 1957; Molotch 1976; Hawley 1981; Taub et al 1984; Fusfeld and Bates 1984) on the class/ethnic/racial transition of neighborhoods and communities.

ENERGY CONSUMPTION AND HOUSING ATTRIBUTES

It is reasonably well established by the data (DOE, 1982, 1983, 1984, 1987, and 1989) that there is a strong correlation between certain housing attributes, such as housing vintage and home type, and energy consumption. Therefore, an analysis of the comparative trends in energy consumption and expenditures between majority and minority households should include an investigation of changes in housing patterns among these groups. The presence of differential rates of change in an important housing attribute, correlated with energy consumption, can possibly help to explain comparative changes in energy consumption and expenditures between groups.

In Tables 4-7, energy consumption and expenditures are shown for majority, black, and Hispanic households by home type and housing vintage for 1980 and 1987. In Table 4, it is clearly established that both total energy and electricity consumption are higher in single-family homes compared to multifamily homes. This fact is invariant with respect to population group -- it holds regardless of whether one is discussing energy consumption in majority, black, or Hispanic households.

It is important to note, however, that the comparative levels of energy consumption by housing type and relative levels of energy consumption between groups, broken down by housing type, are different. Notwithstanding home type, total energy consumption in black households is higher and electricity consumption is lower than in majority households. However, the difference is relatively small in the case of single family homes. For Hispanics, the

Table 4. Energy Consumption By Population Group and Housing Type: 1980 and 1987 (10^6 Btu/Household)

Housing Type	Majority		Black		Hispanic	
	Total Energy	Electric Energy	Total Energy	Electric Energy	Total Energy	Electric Energy
Single family						
1980	125.47	35.92	131.20	29.84	104.45	30.88
1987	114.88	36.27	117.12	30.94	102.24	34.50
% Difference	-8.44	0.97	-10.73	3.69	-2.12	11.72
Multifamily						
1980	87.27	19.29	118.20	14.79	85.63	11.22
1987	69.17	19.67	106.72	18.32	75.05	14.26
% Difference	-20.74	1.97	-9.71	23.87	-12.36	27.09
Other						
1980	92.29	28.82	156.86	25.91	109.22	30.19
1987	87.79	31.14	109.81	21.55	71.47	26.16
% Difference	-4.88	8.05	-29.99	-16.83	-34.56	-13.35
All						
1980	113.46	31.43	127.53	23.06	98.26	24.01
1987	100.33	31.55	110.53	24.89	87.31	25.81
% Difference	-11.57	0.38	-13.33	7.94	-11.14	7.50

Sources: DOE 1982a and 1989a.

consumption of electricity by home type is lower than for the majority. In single-family homes, total energy consumption by Hispanics is lower, in both 1980 and 1987, than in majority households. And in multifamily housing, the level of energy consumption is about the same for Hispanics and majority.

Hispanic electricity consumption is lower than majority consumption in all cases, although it is only slightly lower for households living in single-family homes.

As seen in Figure 2, in all cases the electricity fraction of total energy consumption is higher for majority households than for black households. However, in the single-family home case, the relative difference does decline between 1980 and 1987 (see Figure 3).

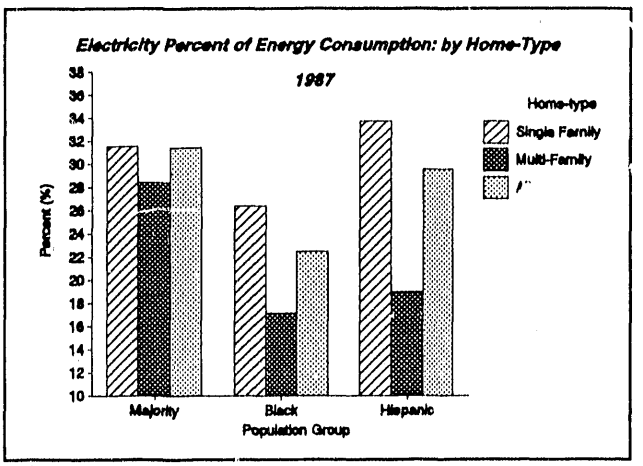

Figure 2

For both majority and black households, the electricity fraction of total energy consumption increases over the 1980 to 1987 period. The electricity fraction also increases in multifamily homes for both the majority and blacks. However, unlike the single-family case, the electricity energy consumption fraction increases by a smaller value for blacks. Instead of a comparatively sharp decline in nonelectric energy use accompanied by a slight increase in electricity consumption, as in the case of single-family homes, the rise in the electricity fraction in black multifamily homes

occurs as the result of both a rapid increase in electricity consumption and a fall in nonelectric energy consumption. In majority multifamily homes there is a dramatic decline in nonelectric energy use and only a moderate increase in electricity consumption, which leaves the majority with a net increase in the electricity energy consumption fraction when compared to blacks, as seen in Figure 3.

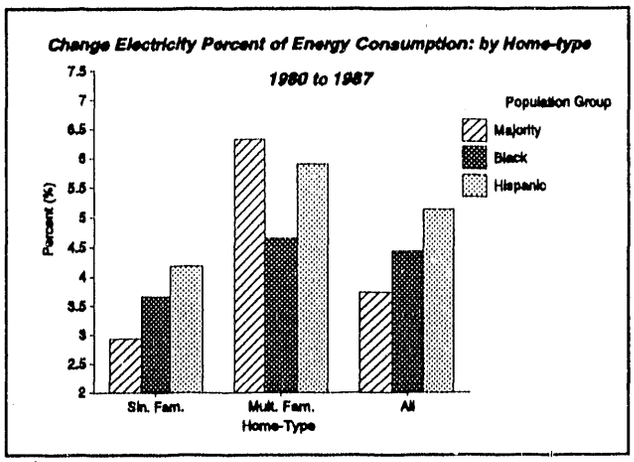

Figure 3

For households living in single-family homes, Hispanic household electricity fraction of total energy consumption is slightly higher than for majority households in 1987 (see Figure 2). However, in the case of multifamily homes, the electricity energy consumption fraction for Hispanics is substantially smaller than for the majority. As in the case of blacks, the change in the electricity consumption fraction for Hispanics relative to that of the majority is higher in single-family homes and smaller in multifamily homes (see Figure 3).

In Table 5, energy expenditures (in 1980 dollars) are shown for each of the three population groups by home type. The information in this table is of particular importance in that it gives a measure of the real value of energy and how it has

Table 5. Energy Expenditures by Population Group and Housing Type: 1980 and 1987 (1980$/household)[1]

Housing Type	Majority		Black		Hispanic	
	Total Energy	Electric Energy	Total Energy	Electric Energy	Total Energy	Electric Energy
Single family						
1980	996.00	565.00	946.00	496.00	789.00	495.00
1987	948.85	570.51	896.89	514.28	823.73	553.03
% Difference	-4.73	0.97	-5.19	3.69	4.40	11.72
Multi-Family						
1980	728.17	344.00	919.90	308.41	671.55	246.15
1987	630.51	350.78	904.75	382.02	660.38	312.84
% Difference	-13.41	1.97	-1.65	23.87	-1.66	27.09
Other						
1980	829.75	466.02	1260.48	473.52	937.21	525.56
1987	828.18	503.53	924.25	393.84	691.41	455.40
% Difference	-0.19	8.05	-26.67	-16.83	-26.23	-13.35
All						
1980	919.00	505.00	958.00	414.00	758.00	411.00
1987	854.06	506.93	892.80	446.85	729.22	441.81
% Difference	-7.07	0.38	-6.81	7.93	-3.80	7.50

Sources: DOE 1982a and 1989a.
[1]Average prices calculated for 1980 are used to calculate 1987 expenditures.

changed between 1980 and 1987 by home type and population group. Throughout the period energy expenditures were the highest for blacks and least for Hispanics. Electricity expenditures on the other hand were highest for majority households and lowest for the minority groups.

Regardless of home type the value of household energy for each group declined over the 1980 to 1987 period -- falling the most for the majority (although only slightly more than for blacks) and least for Hispanics. The electricity component of energy expenditures, however, increased for each group over the 1980-87 period, increasing the most for minority households.

In single-family homes, real energy expenditures declined for black and majority households, declining somewhat more for blacks. For Hispanics, overall energy expenditures in single-family homes actually increased slightly. This increase was driven primarily by a dramatic increase in Hispanic electricity consumption. For majority and black households, the increases in electricity expenditures are more modest over the 1980-87 period. Over that period, the change in real electricity expenditures for blacks living in single-family homes were larger than for majority households.

Also shown in Table 5 are real energy and electricity expenditures for majority and minority households living in multifamily homes. The most prominent fact is the very high level of energy expenditures by black households living in multifamily homes, and the relative persistence of those high levels of

expenditures over the seven year period. In contrast, for majority households the change in energy expenditures over the period was substantially lower than for minority households. This was attributed to a combination of much lower nonelectric energy consumption and a much lower growth in electricity consumption.

As shown in Figure 4, for each population group the electricity share of total energy expenditures is higher in single-family homes and highest in Hispanic single-family homes. Hispanic households, in the multifamily case, also spend a larger share of their energy expenditures on electricity. The expenditure share difference between single-family and multifamily homes is smallest in majority households.

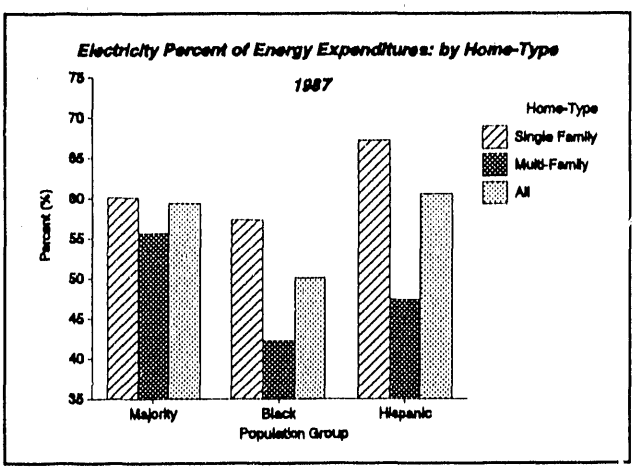

Figure 4

In Figure 5, the change in the electricity expenditure share between 1980 and 1987 is shown. The biggest increases in electricity expenditure share occurs in multifamily housing, with the biggest increase occurring for Hispanic households. In single-family

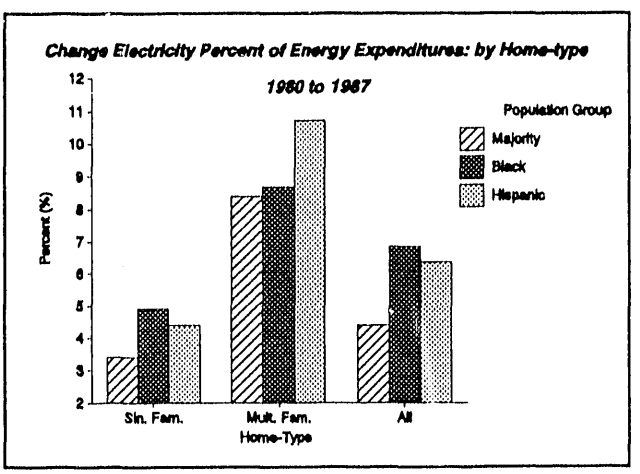

Figure 5

homes the increase in electricity expenditure share was largest for minority households.

Shown in Table 6 is energy consumption by population group and housing vintage for 1980 and 1987. Total energy consumption increases and electricity consumption declines in later vintage homes in every case.

Energy consumption by blacks in older homes (built before 1950) is much higher than for the majority, and electricity consumption is smaller. In homes built between 1950 and 1974, total energy consumption for the majority and blacks was approximately the same in 1980 and 1987. However, electricity consumption by majority

Table 6. Energy Consumption By Population Group and Housing Vintage: 1980 and 1987 (10^6 Btu/Household)

Housing Vintage	Majority		Black		Hispanic	
	Total Energy	Electric Energy	Total Energy	Electric Energy	Total Energy	Electric Energy
Built < 1950						
1980	127.45	23.75	144.72	17.72	107.20	16.22
1987	114.01	24.91	132.89	17.46	94.79	19.85
% Difference	-10.55	4.88	-8.17	-1.47	-11.58	22.38
1950 to 1974						
1980	112.52	33.56	115.26	26.78	93.95	23.93
1987	103.04	30.85	99.36	28.17	90.88	28.55
% Difference	-8.43	-8.08	-13.79	5.19	-3.27	19.31
Built > 1974						
1980	82.33	43.04	76.77	39.34	86.80	44.73
1987	79.21	40.78	75.91	37.88	66.88	30.41
% Difference	-3.79	-5.25	-1.12	-3.71	-22.95	-32.01
All						
1980	113.46	31.43	127.53	23.06	98.26	24.01
1987	100.33	31.55	110.53	24.89	87.31	25.81
% Difference	-11.57	0.38	-13.33	7.94	-11.14	7.50

Sources: DOE 1982a and 1989a.

households was higher than for blacks in both years. In homes built after 1974, total energy consumption and electricity consumption in black households is smaller than in majority households in both years.

For Hispanics, energy and electricity consumption is in most cases lower than it is for the majority. An exception to these cases is found in homes built after 1974, where the level of energy and electricity consumption in 1980 is higher for Hispanic households than majority households.

For each population group, there was a decline in energy consumption within each housing-vintage category between 1980 and 1987. In general, the percentage decline in energy consumption was larger in homes of earlier vintage. This was true for each population group, with the exception of Hispanics, where the percentage decline in energy consumption between 1980 and 1987 was much larger in homes built after 1974 than in earlier housing vintages[2].

In old homes, which are defined as built before 1950, total energy consumption fell the most in Hispanic households and least for black households, with the percent change in energy consumption for majority households falling in between the change for Hispanics and blacks.

In homes built between 1950 and 1974, once again the percent change in energy consumption for majority households falls between

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[2]It should be noted that because of the small Hispanic sample size the standard errors associated with their values are relatively large.

that of black and Hispanic households. The percentage decline in energy consumption in black households living in homes built between 1950 and 1974 is the largest between 1980 and 1987.

The most salient feature associated with homes built after 1974 is the large decline in energy consumption in Hispanic households. For Hispanics living in homes built during this period, the decline in energy consumption is driven by a large fall in electricity consumption.

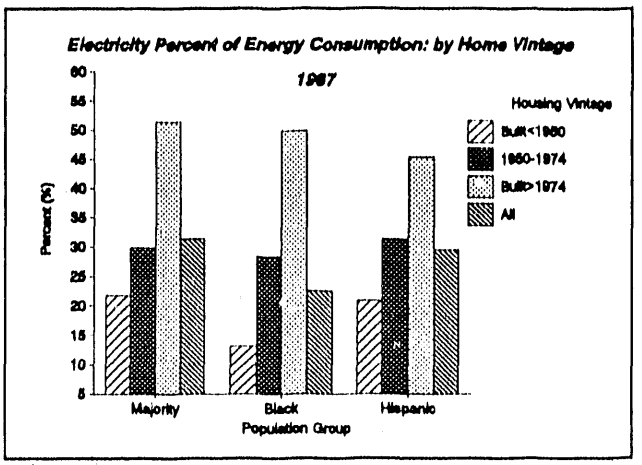

Figure 6

In 1987, as seen in Figure 6, the electricity fraction of total energy consumption increases with later housing vintages for each population group. In every case majority electricity fraction is larger than for blacks, and in every case, with the exception of the 1950 to 1974 vintage home, it is larger than for Hispanics.

In black households living in homes built before 1950, the electricity fraction is exceptionally low compared to majority households. This fact is due to the very large amount of nonelectric energy consumed by blacks living in homes of this vintage.

Overall, the electricity fraction of total energy consumption increases the most for minority households as seen in Figure 7. This is particularly true in older-vintage homes: in homes built

before 1950 and between 1950 and 1974 the increase in the Hispanic electricity fraction is substantially larger than it is for majority households, and in homes built between 1950 and 1974 the black fraction is much higher than the majority's. In homes built after 1974, the electricity fraction of total energy consumption declines for each population group between 1980 and 1987. The biggest decline in the electricity fraction of total energy consumption occurs for Hispanic households.

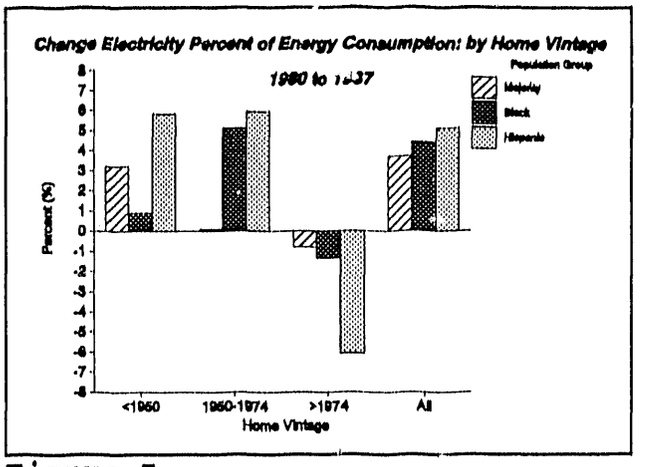

Figure 7

In Table 7, energy expenditures (1980 $) by population group and housing vintage are shown. As in the case of energy consumption, in most cases energy expenditures increase as the vintage of the household increases. The exception to this rule is Hispanic energy expenditures in homes built after 1974. In this case Hispanic energy expenditures were higher than in either the built before 1950 case or in the 1950 to 1974 vintage cases in 1980, and energy expenditures in the 1950 to 1974 vintage case are higher than in the built before 1950 vintage case in 1987.

In 1980 and 1987, overall energy expenditures were higher for black than for majority households, this despite the fact that energy expenditures were lower for blacks in two of the three housing-vintage categories -- 1950 to 1974 and after 1974. Accompanying these facts was the point that majority households

Table 7. Energy Expenditures by Population Group and Housing Vintage: 1980 and 1987 (1980$/household)

Housing Vintage	Majority		Black		Hispanic	
	Total Energy	Electric Energy	Total Energy	Electric Energy	Total Energy	Electric Energy
Built<1950						
1980	954.00	405.00	1053.00	356.00	768.00	308.00
1987	896.49	424.78	984.28	350.78	755.83	376.93
% Difference	-6.03	4.88	-6.53	-1.47	-1.58	22.38
Built: 1950-1974						
1980	915.00	534.00	867.00	441.00	721.00	418.00
1987	839.21	490.88	806.64	463.89	768.42	498.70
% Difference	-8.28	-8.07	-6.96	5.19	6.58	19.31
Built>1974						
1980	843.00	652.00	813.00	657.00	835.00	661.00
1987	804.58	617.76	791.12	632.62	600.22	449.39
% Difference	-4.56	-5.25	-2.69	-3.71	-28.12	-32.01
All						
1980	919.00	505.00	958.00	414.00	758.00	411.00
1987	854.06	506.93	892.80	446.85	729.22	441.81
% Difference	-7.07	0.38	-6.81	7.93	-3.80	7.50

spend more on electricity than blacks[3].

Between 1980 and 1987, energy expenditures decline for both majority and black households. The overall decline was comparable, but in homes built after 1950, the percentage decline in energy expenditures for blacks was smaller than for the majority.

Over the 1980 to 1987 period, majority electricity expenditures remained relatively constant, whereas they increased for black households. In the 1950-1974 and after 1974 vintage homes, there was a relative increase in black electricity expenditures more than for the majority. However, only in the 1950-1974 vintage home was there an increase in the average level of electricity consumption per household in black households.

Hispanic energy expenditures in 1980 and 1987 were lower than for the majority. The change in total energy expenditures for Hispanics was lower than for the majority for every housing vintage, with the exception of homes built after 1974.

The relatively smaller decline in total energy expenditures by Hispanics was driven by a similar percent increase in electricity expenditures and a much smaller decline in nonelectric energy expenditures. Despite the similarity in the overall percentage change in electricity expenditures, the percentage change by housing vintage varies dramatically. In the two early housing-vintage categories, there was a spectacular increase in Hispanic electricity expenditures and in the built after 1974 housing

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[3]The overall values, and consequently changes, in energy expenditure values between 1980 and 1987 are dependent on the population shifts among the three housing vintage categories.

vintage there was a dramatic decline in electricity expenditures.

The 1987 values for the electricity expenditure share of energy expenditures are shown by population group and housing vintage in Figure 8. As in the case of consumption, the electricity expenditure share declines in earlier housing vintages.

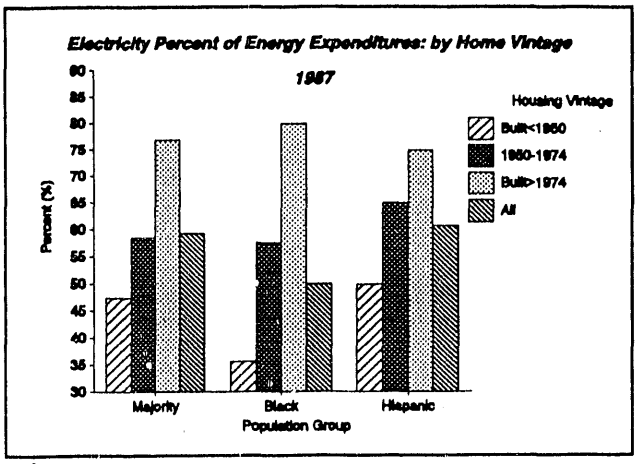

Figure 8

Generally, the majority electricity expenditure share of total energy expenditures was higher than for blacks in 1987. In homes built before 1950 the difference was quite large. In this case, blacks spent a substantially smaller fraction of their energy expenditures on electricity than the majority. At the other end of the housing-vintage spectrum, in homes built after 1974, blacks spent a slightly greater fraction of total energy expenditures on electricity.

The overall electricity expenditure share of total energy expenditures for Hispanics was higher than for majority households. In the earlier-vintage homes -- built before 1950 and built between 1950 and 1974 -- the Hispanic electricity expenditure share was higher than for the majority but in homes built after 1974, it was slightly lower.

In Figure 9, the change in the electricity expenditure share between 1980 and 1987 is shown. Generally, the percent of all

energy spent on electricity increased over the period. The increase was particularly pronounced in the earlier-vintage homes. For each of the population groups the electricity expenditure share value increased in homes built before 1950 and between 1950 and 1974. However, for homes built after 1974, the electricity share value fell.

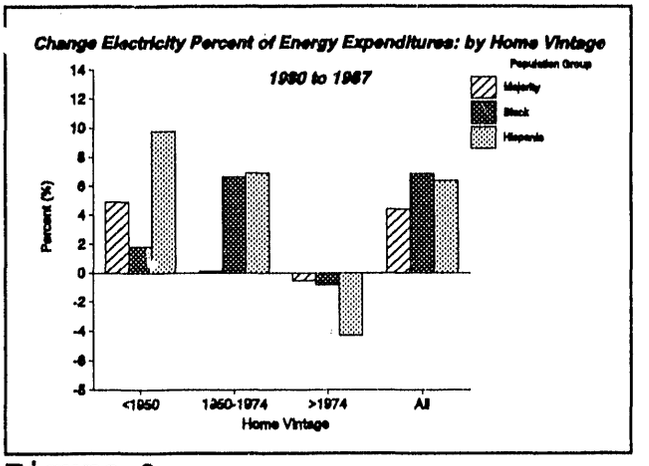

Figure 9

In general, the electricity expenditure share value increased more for minority households. The largest increase was for black households, who have historically spent a much smaller share of their total energy expenditures on electricity.

There was a relatively large increase in the electricity share of total expenditures for Hispanic households living in homes built before 1950 and between 1950 and 1974. The increase in electricity share for Hispanics living in homes built during those periods was greater than for the majority. In homes built after 1974, on the other hand, the electricity expenditure share declined for both majority and Hispanic households, dropping more for Hispanics.

The overall increase in electricity expenditure share for blacks, which was larger than for the majority, was driven by the large increase in electricity share for blacks living in homes built between 1950 and 1974.

It is reasonably clear that home type and housing vintage are highly correlated with the level and pattern of energy use. Therefore, the movement of household population across and within home-type and housing-vintage categories will influence the relative change in energy consumption and patterns of use between population groups.

In the preceding section, the within category relationship between variable levels and energy use were discussed. It is of course possible to have a simultaneous change between periods in variable levels for both home type and housing vintage. In the next section a brief analysis of real energy expenditures by home type, housing vintage, and population category will be presented.

To what extent can changes in energy use patterns, seen at a specific level within one of the two variable categories, be explained by changes in the household population composition across levels in the other category?

ENERGY EXPENDITURES VS HOME TYPE AND HOUSING VINTAGE

Table 8 gives a multidimensional view of energy expenditures for each of the population groups between 1980 and 1987. Compared to the single-dimensional tables given in the preceding section, it provides a better idea of the relative measure of energy expenditures between different housing-vintage (housing-type) classes by holding the housing type (housing-vintage) class constant.

Generally, the relative level of energy expenditures between the different housing classifications for the population groups differs. Furthermore, changes in the relative level of energy expenditures between 1980 and 1987 for the different population groups also differ. In many cases, energy expenditures might fall for one group and may increase for another in the same housing classification. There are a number of possible reasons why these differences might occur. Some reasons which may explain the relative variations in the level and rate of change in energy expenditures between these groups are differences in regional location or in conservation investment (financed either publicly or privately) and demographic and economic factors.

In 1980, with the exception of Hispanic homes, for single-family homes the highest level of energy expenditures occurred for homes built between 1950 and 1974[4]. In particular, majority energy expenditures were the highest in this classification. Energy

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[4]This, of course, is not surprising since these homes were built during a period of relatively inexpensive energy.

Table 8 Household Energy And Electricity Expenditures By Home Type and Housing Vintage: 1980 and 1987 (1980$)[1]

	Single family Detached						Multi-Family					
Vintage	<1950		1950-74		>1974		<1950		1950-74		>1974	
Population Group	Electric	Energy	Electric	Energy	Electric	Energy	Electric	Energy	Electric	Energy	Electric	Energy
Majority												
1980	450.00	982.00	599.00	1007.00	783.00	995.00	281.00	868.00	350.00	676.00	454.00	572.00
1987	462.91	929.89	570.01	950.01	728.73	940.18	323.63	763.81	320.33	584.15	414.54	522.81
%dif	2.87	-5.31	-4.84	-5.66	-6.93	-5.51	15.17	-12.00	-8.48	-13.59	-8.69	-8.60
Black												
1980	402.00	948.00	529.00	952.00	754.00	905.00	301.00	1075.00	310.00	749.00	398.00	547.00
1987	381.07	864.70	546.14	880.99	811.52	956.17	319.87	1061.98	379.60	714.07	477.74	643.16
%dif	-5.21	-8.79	3.24	-7.46	7.63	5.66	6.27	-1.21	22.45	-4.66	20.04	17.58
Hispanic												
1980	375.00	702.00	446.00	773.00	825.00	978.00	223.00	779.00	302.00	577.00	150.00	338.00
1987	432.22	749.83	646.57	905.45	606.85	800.39	321.48	723.46	237.61	571.76	292.07	403.28
%dif	15.26	6.81	44.97	17.13	-26.44	-18.16	44.16	-7.13	-21.32	-0.91	94.71	19.31

Sources: DOE 1982a and 1989b.
[1]Average prices calculated for 1980 are used to calculate 1987 expenditures.

expenditures for both majority and black households living in single-family homes built between 1950 and 1974 fell substantially between 1980 and 1987.

In 1980, Hispanics living in single-family homes built between 1950 and 1974 spent considerably less on energy than other groups. However, there was an extremely large increase in Hispanic energy expenditures between 1980 and 1987[5]. The increase was driven by a large increase in electricity expenditures. This increase was so large, in fact, that on average Hispanic electricity expenditures went from being about 75% of majority electric expenditures in 1980 to over 110% of majority electricity expenditures in 1987.

As in the case of single-family homes built between 1950 and 1974, for homes built before 1950 there was a decline in total energy expenditures for majority and black households and an increase for Hispanics. The increase in energy expenditures for Hispanics was not as great as in the 1950 to 1974 vintage case but it was still substantial. Despite the increase, however, the level of energy expenditures by Hispanics in 1987 was still significantly below that of the majority.

In the earlier-vintage single-family homes, there was a relative increase in the electricity expenditure share of total energy expenditures. This was particularly true for Hispanics for whom the increase in electricity expenditures was more than 12 and

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[5]In general, changes in Hispanic energy consumption and expenditures have been quite large compared to other groups. These large changes are unquestionably due in part to the rapid and uneven increase in the Hispanic population throughout the U.S.

nearly 50 percentage points higher than the majority's in single-family homes built before 1950 and between 1950 and 1974, respectively.

In single-family homes built after 1974 the decline in electricity expenditures for the majority and Hispanics was relatively large compared to nonelectric energy expenditures. Consequently, the electricity expenditure share of total energy expenditures declined between 1980 and 1987 for both groups. This was not the situation for blacks. In single-family homes built after 1974, black electricity expenditures increased relative to nonelectric energy expenditures. This increase was not completely offset by a decline in nonelectric expenditures; as a result, total energy expenditures increased for blacks living in single-family homes built after 1974.

In single-family homes, the variance in energy expenditures and its pattern of change was relatively moderate when compared to multifamily homes. The energy expenditure differences among population groups, housing-vintage classes, and time periods can be very large.

Generally, the total level of energy expenditures declines with the move from earlier- to later-vintage multifamily housing. This is particularly true for black households, when in 1980 energy expenditures in multifamily homes built after 1974 was almost half the value of what it was in homes built before 1950 and about 60% in 1987.

Energy expenditures for black households living in multifamily

homes built before 1950 were exceedingly high in 1980 and 1987. Energy expenditures for blacks falling in this classification were higher than for any other classification. Furthermore, the decline in energy expenditures between 1980 and 1987 was very small -- nearly a tenth of what it was for majority living in multifamily homes built before 1950.

Generally, energy expenditures were lower in multifamily housing than in single-family housing for the same housing-vintage class, except for black and Hispanic multifamily homes built before 1950.

In multifamily housing, majority household energy expenditures decline rather dramatically between 1980 and 1987. In fact, for each housing-vintage class there was a relatively larger decline in multifamily than in single-family homes. For minorities, on the other hand, there were declines in energy expenditures in multifamily homes built before 1950 and between 1950 and 1974, respectively, but for both Hispanics and blacks energy expenditures increased dramatically in multifamily homes built after 1974. In all cases the level of energy expenditures by minorities increased relative to those of the majority between 1980 and 1987.

CONCLUSION

The energy consumption and expenditure picture for blacks and Hispanics is spotted with similarities and differences compared to the majority. In general, blacks consume more nonelectric energy and less electricity than the majority. Hispanics consume less nonelectric energy and electricity than the majority but the electric fraction of total energy use is about equal that of the majority.

On the more important side of the ledger -- the energy expenditure side -- the data reveal some positives and negatives. On the positive side is the level of energy expenditures and relative changes in energy expenditures by blacks in older (those built before 1974) single-family homes. For both vintage single-family homes built before 1950 and those built between 1950 to 1974, the level of energy expenditures fell more between 1980 and 1987 for blacks than for the majority. Moreover, this occurred on top of a lower energy expenditure base. An important policy question related to this process is to what extent Federal, local, and utility sponsored programs contributed to the disproportionate decline in black energy expenditures compared to other intervening variables such as income, climate, and demographics?

For Hispanics living in single-family homes built after 1974, as with blacks living in single-family homes built before 1974, energy expenditures fell dramatically between 1980 and 1987 when compared to majority expenditures. Once again, this fall in Hispanic expenditures occurred on top of a smaller base, leaving

the level of Hispanic energy expenditures even lower relative to the majority (in 1980 expenditures were about the same, whereas in 1987 Hispanic energy expenditures were 20% lower than the majority's).

On the negative side, the most prominent feature of this analysis is the comparative level of energy expenditures and the trend in energy expenditures for black households living in multifamily homes built before 1950. The intragroup and intergroup comparison of this classification points to a number of potentially disturbing realities.

It is suspected that households living in older multifamily dwellings are typically poorer; combining this suspicion with the fact that energy expenditures for blacks living in old multifamily housing are higher than for any other group implies that a disproportionately higher share of income is being spent on energy by this group. Furthermore, a substantial percentage of the black population still lives in multifamily homes built before 1950. Therefore, a comparatively bad situation is affecting a disproportionately large segment of the black household population.

Compounding the problem is the presence of relative inertia in the energy expenditure levels for black households living in multifamily homes built before 1950[6]. In comparison to other groups

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[6]This troublesome aspect of the problem may also be related to the fact that these units are located in economically depressed and racial segregated enclaves. The units are typically rental units owned by individuals who reside outside the area. Consequently, because of falling property values the incentive to invest and keep these properties in good repair is often absent.

living in similar housing, there was little decline in energy expenditures between 1980 and 1987. Thus, the relative position, from an energy expenditure perspective, of black households deteriorated.

There were also a number of other troubling trends for Hispanics living in older single-family homes, blacks living in newer homes, and minorities living in multifamily dwellings in general.

For Hispanics living in single-family homes built before 1950 and between 1950 and 1974, as mentioned earlier, there were dramatic increases in the level of energy expenditures compared to the majority. It is suspected that these volatile changes in energy expenditures might be due to a change in the regional distribution of Hispanics. Such a change may result in a disproportionate increase in the number of Hispanics, who generally live in older homes, residing in the South (primarily the southern parts of Texas and California) where electricity demand is greater.

For blacks living in single-family homes built after 1974, the relative rise in energy expenditures between 1974 and 1980 might be due to a relative increase in the number of blacks, who generally live in homes built after 1974, residing in the South, or to a disproportionate increase in the purchase of less expensive all-electric homes.

Finally, along with the circumstance of black households living in multifamily units built before 1950 that was described earlier is the general circumstance associated with changes in

minority energy expenditures for those who live in multifamily units, regardless of their vintage. Compared to majority households living in multifamily units, the relative measure of energy expenditures for minorities increases between 1980 and 1987.

For the most part the points raised in this section are speculative in nature and beg for additional research. It is important to further control variations in the data to uncover more precisely the effect of housing stock variables on energy expenditures in general and their comparative effects on energy expenditures in different population groups. Without taking a closer look at the data, it cannot be determined how important such variables as climate and income are in determining changes in expenditures within a housing classification. Even more subtle are the energy/nonenergy effects associated with price changes. To capture the influence of changing prices in general on energy expenditures a fullblown demand system should be specified and estimated. This type of analysis is now being conducted at Argonne National Laboratory under the auspices of the U.S. Department of Energy, Office of Minority Economic Impact.

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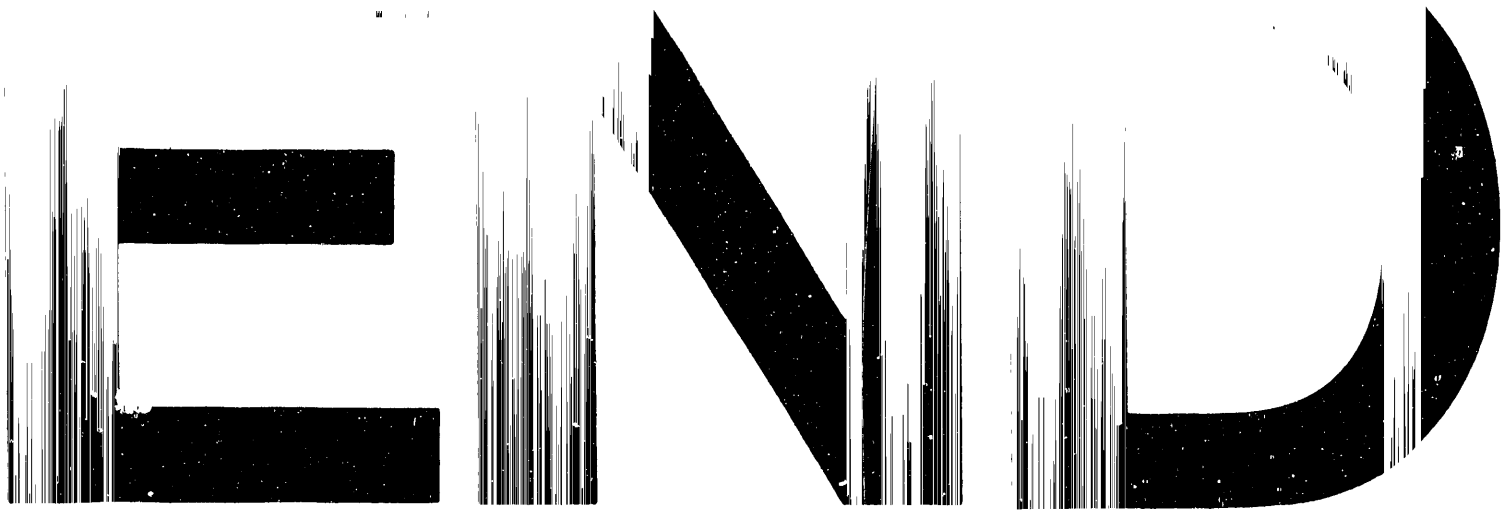

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