

CHANGES IN THE PROPENSITY TO LIVE ALONE: 1950-1976

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Abstract—The growth in single-person households is a pervasive behavioral phenomenon in the United States in the post-war period. In this paper we investigate determinants of the propensity to live alone, using 1970 data across states for single men and women ages 25 to 34 and for elderly widows. Income level appears to be a major determinant of the propensity to live alone. The estimated cross-state equations track about three-quarters of the increase in the propensity to live alone between 1950-1976 and suggest that income growth has been the principal identified influence. Other variables found to affect (positively) the propensity to live alone include mobility, schooling level, and for young people a measure of social climate; non-whites appear to have a somewhat lower propensity to live alone.

In the past quarter century has witnessed profound changes in social and economic conditions, the basic causes of which are only partially understood, and the long-run consequences even less clearly perceived. Dramatic changes in female labor force participation, marriage and divorce, fertility, and illegitimacy have been depicted and analyzed in numerous studies, and economic theories of household behavior have multiplied. One of the most profound but relatively neglected changes of recent decades has been the increase in the proportion of adults who live alone, from 3.9 percent in 1950 to 10.2 percent by 1976. The rate of growth of single-person households, adjusted for changes in population size and age-marital status composition has been an astounding 3.6 percent per annum. A related, much-discussed phenomenon, the growth of female-headed families, had an

adjusted growth rate of only 1.1 percent per annum over the same 26 years.

The decrease in average household size and the increase in primary individuals has attracted attention (Beresford and Rivlin, 1966; Troll, 1971; Chevan and Korson, 1972; Carliner, 1975; Kobrin, 1976; and Kuznets, 1978) but there have been relatively few attempts to explain the trends through quantitative multivariate analysis. In this paper we analyze the 1970 cross-state variation in the propensity to live alone of two important demographic groups—single persons ages 25 to 34 and widows age 65 and over. These groups exhibited substantial increases in the propensity to live alone between 1950 and 1976 (see Table 1) and accounted for 43 percent of the 11 million person increase in adults living alone over that period. We use the estimated cross-sectional structures to explain the corre-

Table 1.—The Propensity to Live Alone, by Marital Status, Age and Sex; 1950 and 1976*

Age and Sex		Marital Status					
		Single		Divorced ^b		Widowed	
		1950	1976	1950	1976	1950	1976
18-24	Men	0.8	6.2	4.0	23.9	-	-
	Women	1.1	6.5	3.1	10.1	-	-
25-34	Men	4.3	28.7	10.7	36.7	-	-
	Women	6.4	29.7	8.7	12.5	8.0	17.3
35-44	Men	9.3	29.5	16.4	39.9	13.5	27.8
	Women	10.8	27.6	14.8	11.1	12.7	8.8
45-54	Men	15.3	32.3	21.2	45.6	19.8	26.6
	Women	16.7	34.5	21.3	30.6	19.3	32.3
55-64	Men	22.0	40.7	27.3	54.4	23.3	54.7
	Women	19.8	45.8	23.9	50.7	23.9	55.2
65-74	Men	26.3	52.0	33.9	73.8	26.2	70.5
	Women	22.5	51.0	27.2	66.7	26.9	68.5
75+	Men	26.3	51.7	32.6	58.6	21.1	60.7
	Women	22.2	55.9	24.0	69.7	21.1	60.7

a--"Propensity" is defined as the ratio of persons living alone to total non-institutionalized population, for specific age, sex, marital status, and year, times 100.

b--"Divorced" includes those divorced, separated, and those few classified as "other" (married, spouse absent).

sponding changes between 1950 and 1976 in each of these two groups' propensity to live alone. Data on individual behavior from a 1972-73 cross-sectional survey are also analyzed.

DATA

We view the decision to live alone as a reflection of an economic demand for privacy or autonomy. Thus, changes in in-

come and prices are considered likely to affect this behavior. Previous writers have identified income as an important determinant of the decision to live alone and many of the other variables suggested in the sociological literature can be thought of as affecting the shadow price of living alone compared to alternative living arrangements.

Without imposing formal restrictions

the demand structure, our theory provides only a general guide to the empirical formulation; our analysis does not present formal hypothesis testing. To model formally the decision to live alone would require an analytical model which took account of the living arrangement choice and marital status choice. The empirical evidence from demographic decomposition, however, indicates that virtually all of the increase in persons living alone is attributable to changes in behavioral marital status. Our finding, reported in Table 1, that the rise in the aggregate propensity to live alone is not attributable to changes in the age-sex-marital status of the population mirrors Cornin's (1976) result for the growth in primary individuals and Carliner's (1975) conclusions for headship rates among the married. In light of this empirical evidence, our research strategy treats as ex-

ogenous not only age and sex but also marital status.

Table 2 shows summary statistics of the variables used in the cross-state regression analyses and the corresponding U.S. aggregate figures for 1950-1976.

SINGLES ALONE is the proportion of never-married men and women ages 25 to 34 who live alone, expressed as a percentage. Its range in variation among states in 1970 (10.1 to 30.6) is similar to its variation in the U.S. aggregate from 1950 to 1976 (5.1 to 29.1).

WIDOWS ALONE is the proportion of widowed women age 65 and over who live alone, expressed as a percentage. Its 1970 cross-state range (26.9 to 64.6) is also comparable to the range in the aggregate from 1950 to 1976 (24.5 to 64.5).

INCOME is defined as per capita income for each state, deflated by a state price index based on retail sales (see

Table 2.—Summary Statistics for Cross-Sectional (50 States) and U.S. Aggregate Time Series Variables

Variable	1970 Cross-State Data				U.S. Aggregate			
	Mean	Standard Deviation	Min.	Max.	1950	1960	1970	1976
SINGLES ALONE (%)	19.4	4.9	10.1	30.6	5.1	13.2	19.4	29.1
WIDOWS ALONE (%)	50.2	5.4	26.9	64.6	24.5	36.2	50.2	64.5
PER CAPITA INCOME (\$100)	33.6	3.5	23.6	41.4	20.8	25.0	33.6	37.8
PER CAPITA INCOME (\$100)	9.7	0.6	6.1	11.3	6.1	7.8	10.5	14.6
PERCENT UNEMPLOYED (dummy 1 = legal)	0.36	0.5	0.0	1.0	0.0	0.0	0.36	1.0
PERCENT UNEMPLOYED (DOT) (%)	98.6	16.6	17.9	139.4	59.6	73.7	98.6	115.0
PERCENT UNEMPLOYED (HILLI) (%)	15.7	6.8	4.2	41.5	17.5	18.9	15.7	15.2
PERCENT UNEMPLOYED (C) (%)	15.4	2.8	9.0	21.0	7.5	11.1	15.4	17.9
PERCENT UNEMPLOYED (ID) (%)	5.9	1.2	4.2	10.5	3.0	3.6	5.9	8.0
PERCENT UNEMPLOYED (E) (%)	12.3	7.7	0.4	61.2	10.5	11.4	12.3	13.1

See the Appendix for the definitions and sources of the variables, and see Appendix Table A-1 for the values of the variables SINGLES ALONE and WIDOWS ALONE for all 50 states.

Fuchs, Michael and Scott, 1979).

SSI is the state's average Social Security payments to survivors, deflated by the state price index.

The two income variables INCOME and SSI are used in the regression analyses of the SINGLES ALONE and WIDOWS ALONE respectively; in both cases alternative measures of income were also used and discussed below. We expect that as income rises the demand for privacy and autonomy rises; thus income is expected to be positively related to the propensity to live alone. Other investigators have found a positive relationship between income and measures similar to "living alone." For example, in an analysis of determinants of household headship, Carliner (1975) found that since 1940 the "increase in headship rates of the unmarried probably comes from increases in their incomes" (p. 36). Likewise, Brady (1958, p. 274) emphasized the importance of economies of scale in explaining her finding for men ages 20 to 24 and their "parents" ages 45 to 64 that "separate households are the rule when both the children and their parents can afford them and seem to prevail when one or the other has sufficient income to help finance more than one consumer unit." In an interesting study of privacy, Beresford and Rivlin (1966) studied living arrangements in the two decades prior to 1960 and found a positive relationship among young married men between income and the likelihood of maintaining a separate household, and a positive relationship among elderly nonmarried women between income and the likelihood of living apart from relatives (pp. 255-256). They contend that since 1940 "people tended to use their rising incomes to purchase additional privacy" (p. 254). This view, that privacy (and autonomy) are "goods," is also expressed in the social-psychological literature. A review of the research of the 1960s concluded, "almost all these surveys show that older people prefer, whenever possible, to live in their homes and not with their children . . . Moving in with

children is resorted to only where there is not enough money to live alone." (Trolldenier, 1971, p. 266).

MOBILITY combines two indicators of the residential stability of the state's population; it is defined as the percentage of the state's population that moved into their 1970 residence in 1969 or 1970 minus the percentage who moved into their 1970 residence before 1950. (These two percentages are highly negatively correlated: -0.85 .) States with high mobility—with many recent movers and/or few persons who have not moved in at least 20 years—should show higher percentages living alone, since mobility is often associated with family separation.

ABORT is a crude proxy for state differences in the liberalness of the social climate measured as a dummy defined as 1 if abortion was legal in 1970 (it was in 19 states).

MOT/DOT is defined as the number of women age 65 and over relative to the number of women ages 35 to 44, expressed as a percentage. We expect the "mother/daughter" ratio to be negatively related to *widow's* opportunity cost or shadow price of living alone.

EDUC and EDWID are, respectively, the percentage of persons 25 to 34 and the percentage of women age 65-69, who have 4 or more years of college. Education typically reflects several influential forces including financial and probably psychological independence and non-market efficiency. These forces probably lower the shadow price of living alone.

RACE is defined as the percentage of the state's population that is nonwhite. The extremely high value reported in Table 2 (61.2 percent) reflects Hawaii's large nonwhite, nonblack population. Analyses with and without Hawaii and Alaska are reported below.

The measure of shadow prices used in the regressions for SINGLES ALONE include MOBILITY, ABORT, and EDUC and in the regressions for WIDOWS ALONE, MOBILITY, MOT/DOT, and EDWID. All are expected to have positive

effects on the propensity to live alone. RACE is also included in both analyses. Previous investigators suggest race (Chen and Korson, 1972), education level, urbanization, prior fertility, religion (Catholic) and mobility (or "residential proximity") as influences on living arrangements (Troll, 1971), but few if any multivariate analyses have been performed.

RESULTS: SINGLES 25 TO 34

Table 3, panel A, shows regression equations estimated across states for the dependent variable SINGLES ALONE. All regressions are state population weighted least squares. The income coefficient in regression Y1 implies an elasticity of 1.9 evaluated at the point of means and a standardized β coefficient of 0.8. The coefficient on income remains quite stable when other potential explanatory variables are included. The income coefficient was also remarkably stable when other measures of real income were used. When experimenting with at least four measures of real income we found no substantial difference in the size or significance of the income coefficient or in income's influence on other coefficients. The use of nominal as distinct from real income did affect (lower) the coefficient although it retained its statistical significance (see Appendix Table A-3).

The ABORT, MOBILITY, and EDUC variables have the expected positive effects. We have no satisfactory explanation for the negative coefficient on RACE. When regression Y3 was run on the continuous 48 states, excluding the outlying observation for RACE, the coefficient for RACE fell to -0.10 ($t = -2.39$) with only very small changes in any of the other coefficients.

Because of the extensive sociological literature which suggests many other phenomena as determinants of the decision to live alone, we also experimented with measures of urbanization, percent Catholic, and an age-specific sex ratio. None of these exhibited statistical significance. We

also estimated regression Y3 separately for men and women but found little difference in the results and no statistical basis for distinguishing the two equations (see Appendix Table A-3).

We have experimented with other measures of income, with additional explanatory variables which add little and alter the regressors in Y3 very little, and pursued several additional checks described below. In light of these efforts, we use regression equations Y1, Y2 and Y3, together with values for the independent variables for the United States as a whole for 1950, 1960, 1970, and 1976 to estimate the change over time in the propensity to live alone. The results are shown in Table 3, panel B. The actual increase over the two and one-half decades was 24.0 percentage points. The regressions "explain" about 18 percentage points, or about three-quarters of the observed increase. These 1970 cross-state regressions perform quite well in tracking the rise in propensity to live alone for this group in the post-war era. Regarding the decade-by-decade changes, in the first decade 1950-1960 the predictions are consistently and substantially too small. Perhaps the dearth of new housing during the 1930s and 1940s and the rapid growth in new housing during the 1950s partially explains the underpredictions.

Decomposing the implied increase into the part attributable to each of the explanatory variables, income is seen as the principal factor in the growth. The following breakdown from Y2 and Y3 is typical:

Implied change 1950-1976 in SINGLES ALONE (in percentage points)

	Regr. Y2	Regr. Y3
INCOME	17.63	13.04
ABORT	3.15	3.00
MOBILITY	-0.52	-0.59
EDUC	-	3.18
RACE	-	-0.31
Total	20.26	18.32

Table 3.—SINGLES ALONE Regression Analysis, Cross-State 1970 (Panel A) and Implied Changes Over Time 1950-1976 (Panel B)

Panel A: Cross-State Regression Analysis							
Regression	Constant	INCOME	ABORT	MOBILITY	EDUC	RACE	\bar{R}^2
Y1	-16.85 (-3.97)	1.08 (8.58)					0.60
Y2	-20.14 (-7.50)	1.04 (13.34)	3.15 (5.30)	0.23 (5.33)			0.85
Y3	-14.74 (-5.15)	0.77 (8.23)	3.00 (5.07)	0.26 (6.91)	0.31 (2.51)	-0.12 (-3.11)	0.89
Y4 ^a	-4.13 (-23.28)	1.12 (13.93)	2.83 (4.62)	0.20 (4.67)			0.85
Y5 ^a	-3.79 (-20.61)	0.81 (8.70)	2.51 (4.22)	0.24 (6.36)	0.38 (3.14)	-0.11 (-3.01)	0.89

Panel B: Actual and Estimated Levels of SINGLES ALONE 1950-1976

	Levels				Changes over Time			
	1950	1960	1970	1976	1950-60	1960-70	1970-76	1950-76
Actual:	5.1	13.2	19.4	29.1	8.1	6.2	9.7	24.0
Implied by Regression:								
Y1	5.6	10.1	19.4	24.0	4.5	9.3	4.6	18.4
Y2	5.4	10.1	19.4	25.7	4.7	9.3	6.3	20.3
Y3	6.8	11.3	19.4	25.1	4.5	8.1	5.7	18.3
Y4	8.2	11.0	19.0	26.0	2.8	8.0	7.0	17.8
Y5	8.8	11.8	18.9	25.2	3.0	7.1	6.3	16.4

a--These regressions are estimated by weighted least squares on the dependent variable $\ln(P/1-P)$ where P is the value of SINGLES ALONE expressed as a decimal. The constant reported is from these regressions. The coefficients for the independent variables reported here are estimated slope coefficients b multiplied by $P(1-P)$ and by 100 to put them in units comparable with the other regressions. The t -values apply to the estimated coefficients b ; the \bar{R}^2 applies to the dependent variable $\ln(P/1-P)$.

A principal conclusion from this analysis is that growth in income has been the major force increasing the proportion of young single adults who live alone. If this

group is typical of the adult population as a whole, then income growth appears to be the most important factor in the post-war increase in single-person household

ever, income growth has character-
 the American economy throughout
 history and one cannot extrapolate
 backward in time from the regression
 coefficient on income to infer the
 percentages living alone decades ago.
 (One would find nonsensical negative per-
 centages.) One possible explanation is
 in recent decades a structural change
 occurred which renders extrapolation in
 the past inappropriate. Beresford and
 (1966) suggest such an argument
 one must also assert that a basic shift in
 occurred at about that time [1940]
 for which people tended to use their ris-
 incomes to purchase additional pri-
 ," p. 254), but neither they nor we
 that explanation satisfactory.

The logistic equations in Table 3, Y4
 Y5, support an alternative, more ap-
 ing explanation. The logistic equa-
 s differ very little from the previous
 sessions. The logistic structure is ca-
 e of dealing with nonlinearities which
 t have existed if the underlying struc-
 did not change in the post-war era:
 is, when we used estimates of the ex-
 atory variables for the year 1900, the
 r regression Y3 yielded nonsensical
 tive estimates of the proportions liv-
 alone, but the logistic equation Y5
 led a quite reasonable estimate of 3.1
 cent. The intuitive interpretation im-
 l by the S-shaped relation between
 propensity to live alone and income is
 a threshold income was reached
 etime in the 1940s after which further
 eases in income had a sizable impact
 ne decision to live alone.

o explore further the shape of the
 onship between the propensity to
 alone and income, several other func-
 l forms were considered. Income was
 red in the regression in a quadratic
 (income and income squared); the
 atoric term was negative but statisti-
 insignificant. Log income was used
 lace of income and it performed as
 as, but statistically no better than, the
 r income term. One form which de-
 es mention is $\ln(\text{ALONE}) = a - b/$

INCOME + This log-reciprocal rela-
 tionship imposes an S-shape on the rela-
 tionship between ALONE and INCOME,
 going through the origin and having its
 point of inflection at the value of IN-
 COME equal to $b/2$ and its asymptote at
 $e^{a/b}$. The regressions comparable to Y1
 and Y3 when run in this form were:

$$\begin{aligned} \text{Y1}' \quad \log(\text{ALONE}/100) = & \\ & .24 - 63.82/\text{INCOME} \quad \bar{R}^2 = .51 \\ & (0.9) \quad (7.2) \end{aligned}$$

and

$$\begin{aligned} \text{Y3}' \quad \log(\text{ALONE}/100) = & \\ & -1.23 - 33.12/\text{INCOME} \\ & (-3.7) \quad (-4.4) \\ & + .01 \text{ MOBILITY} + .12 \text{ ABORT} \\ & (4.4) \quad (2.7) \\ & + .03 \text{ EDUC} - .01 \text{ RACE} \quad \bar{R}^2 = .79 \\ & (3.3) \quad (-4.1) \end{aligned}$$

According to Y1' the slope of the linear
 relationship $d \text{ ALONE}/d \text{ INCOME}$
 varies from a value 1.01 at the sample's
 lowest level of the income variable (25) to
 1.03 at the sample's highest level of the
 income variable (40). (The intercept a is
 not statistically different from zero so the
 implied asymptote is not different from e^0
 $= 1.0$.) Thus the curvature of the S-
 shaped relationship within the range of
 the observed values does not seem to be
 very great.

From Y3' the slope $d \text{ ALONE}/d$
 INCOME varies from 0.71 to 0.46 with
 the inflection point outside the range of
 the observed income at 16.6. So when the
 variables MOBILITY, ABORT, EDUC,
 and RACE are included, the curvature of
 ALONE with INCOME is convex over
 the whole range and the implied
 asymptote is $\exp(a + .01 \text{ MOBILITY} +$
 $.12 \text{ ABORT} + .03 \text{ EDUC} - .01 \text{ RACE})$
 which at the mean values of the variables
 is .51, a much lower asymptote than the
 1.0 imposed by the logistic.

Both the logistic and the log-reciprocal
 form imply that there is curvilinearity to
 the relationship between the propensity to

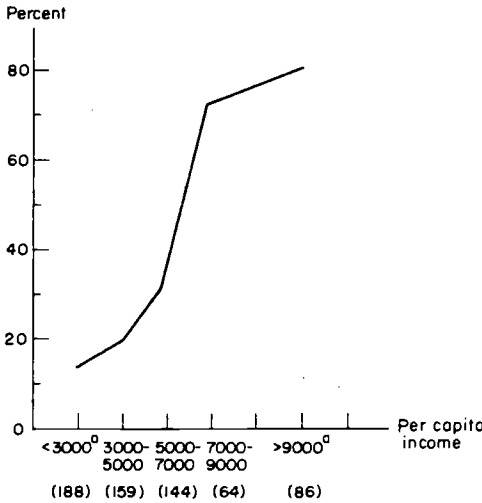


Figure 1.—Percentage of Unmarried Males Ages 25-34 Living Alone, By Per Capita Income

a—the open-ended intervals are placed at \$2,000 and \$12,000 per capita income.
 Note: Number of observations in each income class in parentheses.
 Source: 1972-1973 Consumer Expenditure Survey.

live alone and income. Using group (state) data there is a relatively narrow range in both the income and proportion living alone variables. Data on individuals provides a wider range of observations. Figure 1 shows such data for men ages 25 to 34 who were *not* married spouse present, drawn from the 1972-1973 Bureau of Labor Statistics' Survey of Consumer Expenditures. (We were unable to perform the same analysis for women because of the problem of measuring per capita income for the not-married women with young children.) Income is defined as per capita after tax household income with no imputations for nonmarket income; the observations are grouped by income as indicated. The relationship between income and the proportion who live alone has a definite S-shape.

Logistic functions were estimated for the 25 to 34-year-old nonmarried men (sample $n = 669$) where the left-hand variable was a dummy, A , defined as 1.0 if the person lived alone and 0 otherwise.

The mean of A is .357. This proportion living alone is somewhat higher than the figure for 1970 from the state data but in this micro data we could not distinguish the maritally single from those divorced or widowed and the proportion of men living alone is substantially lower for the singles. The average per capita income is 56.0 (in hundred dollar units) so that the somewhat higher incomes may also help explain the higher proportion living alone. The logistic function estimated on the individual data by maximum likelihood with income as the only explanatory variable was:

$$A = 1/1 + \exp - \left\{ \begin{matrix} -2.34 + .03 PCY \\ (-12.0) \quad (10.1) \end{matrix} \right\}$$

Asymptotic Chi-Square (1) = 139.

Expressed in units comparable to the coefficients on income in the regression in Table 3, the implied coefficient here is .70, or an income elasticity of 1.09.

When this logistic function was fit with several other exogenous variables the result was:

$$A = 1/1 + \exp - \left\{ \begin{matrix} -4.91 + .03 PCY \\ (-5.0) \quad (9.5) \end{matrix} \right\}$$

$$+ .09 \text{ Age} + .47 \text{ Black}$$

$$(2.7) \quad (1.5)$$

$$+ .14 \text{ SMSA} - 1.06 \text{ Rural}$$

$$(0.7) \quad (-2.7)$$

Asymptotic Chi-Square (5) = 159.

In these data as well, the income term remains very significant and dominates the other exogenous variables. Thus the individual data provide further support for the finding that income plays a central role as a determinant of the propensity to live alone.

RESULTS: WIDOWS

Table 4, panel A, shows regression results for WIDOWS ALONE. As with the regressions for singles, the income effect is substantial: from regression W1, the income elasticity is 1.04 at the mean, and the β coefficient is 0.6. However, in com

Table 4.—WIDOWS ALONE Regression Analysis, Cross-State 1970 (Panel A) and Implied Changes Over Time 1950-1976 (Panel B)

Panel A: Cross-State Regression Analysis							
Regression	Constant	SSI	MOT/DOT	MOBILITY	EDWID	RACE	\bar{R}^2
	-2.17 (-0.24)	5.40 (5.79)					0.40
	-3.33 (-0.41)	4.34 (4.13)	0.06 (1.49)	0.33 (4.04)			0.54
	13.52 (1.23)	2.34 (1.98)	0.07 (1.92)	0.30 (2.66)	0.80 (1.33)	-0.22 (-2.48)	0.62
	-2.16 (-6.46)	4.40 (4.10)	0.06 (1.49)	0.33 (4.00)			0.53
	-1.46 (-3.24)	2.33 (1.94)	0.07 (1.92)	0.30 (2.65)	0.78 (1.28)	-0.23 (-2.53)	0.62

Panel B: Actual and Estimated Levels of WIDOWS ALONE 1950-1976

	Levels				Changes over Time			
	1950	1960	1970	1976	1950-60	1960-70	1970-76	1950-76
Actual:	24.5	36.2	50.2	64.5	11.7	14.0	14.3	40.0
Implied by Regression:								
	28.1	36.8	50.1	70.2	8.7	13.3	20.1	42.1
	30.6	38.9	50.1	67.1	8.3	11.2	17.0	36.5
	36.3	41.8	50.1	61.4	5.5	8.3	11.3	25.1
	31.3	38.9	50.1	66.7	7.6	11.2	16.6	35.4
	36.7	41.9	50.1	61.2	5.2	8.2	11.1	24.5

—See Table 3 for information on these logistic function coefficients.

st to the robustness of the income coefficient in the singles regressions, for widows the income coefficient is much more unstable, with a consequent loss of confidence.

Before discussing the income effect in more detail, we note that MOT/DOT and MOBILITY add substantially to the explained variance and both have the ex-

pected sign although MOT/DOT does not exhibit statistical significance. EDWID is positive as it was for the SINGLES ALONE but it lacks significance here (when entered without RACE, EDWID had a coefficient of 1.29 and a $t = 2.15$). The race variable appears significant, but when we exclude Alaska and Hawaii RACE's coefficient in regression

W3 falls to an insignificant -0.17 ($t = -1.67$) so in part the race variable here is simply picking up the low value of WIDOWS ALONE in Hawaii.

The race variable might have been excluded altogether, but its influence on the volatile income coefficient deserves mention. As we did with the singles, we reran regressions W1, W2, W3 with several different measures of widow's income. One such measure, SSI', deflates Social Security income by a slightly different state price index. SSI' correlated .94 with the original variable SSI but the income coefficients in regressions W1, W2, W3 using SSI' were: 4.19 ($t = 4.28$); 2.18 ($t = 1.93$); 0.16 ($t = 0.14$) respectively. If RACE is excluded from W3 the income coefficient on SSI' regains significance at 2.04 ($t = 1.89$).

The dependent variable WIDOWS ALONE has little relative variation—a coefficient of variation of .11 as compared with .25 for SINGLES ALONE. Similarly the income measure SSI has little variation—.06 compared to INCOME's .10. While the simple regression of the propensity to live alone on income is not much weaker for widows than for the singles, the *partial* relationship with income for the widows is substantially weaker. Whether this weaker partial relationship between WIDOWS ALONE and income reflects a weaker underlying causal structure or simply less variation in the two variables or a less well-measured income proxy for the widows, we do not know.

As Social Security income does not represent the entire income available to elderly widows, a more comprehensive income measure was also used. WINC is the state's median income of unrelated women age 65 and over, deflated by the price index. The mean of WINC is 15.1 compared to SSI's mean of 9.7, and its coefficient of variation is .12; its correlation with SSI is only .53 and its correlation with WIDOWS ALONE is .52. When used in regression W1, its coefficient is 1.52 ($t = 4.17$) but in W2 and W3 it lacks statistical significance.

Another measure of income, focusing on the lower tail of the income distribution is POV, the percentage of the state's unrelated women age 65 and over who were living in poverty. Once again, when entered alone (and with a state price index) it had the expected sign and exhibited significance, but when used in place of SSI in regression W3 it was not significant.

Returning to the regressions in Table 1, the logistic forms W4 and W5 for the widows show very similar results to the weighted least squares. Confidence in our interpretation of these regressions is increased by experimentation done with regressions Y3 and W3 (from Tables 3 and 4). SINGLES ALONE was regressed on the mobility and race variables and on the three variables used in the analysis of widows, SSI, MOT/DOT and EDWIDOWS, and likewise we regressed WIDOWS ALONE on MOBILITY and RACE and on the three variables used in the analysis of the singles, INCOME, ABORT, and EDUCATION. These misplaced variables should not have significant effects. MOBILITY and RACE retained significance in both regressions, but *none* of the other three variables in either regression was significant.

Furthermore, a rather high correlation (+.57) between the residuals from regressions Y3 and W3 suggests that there are other factors which differ among states and systematically influence decisions about living alone. Unable to identify or measure these factors directly, we included the residual from regression Y3 as an additional independent variable in a regression on WIDOWS ALONE, and vice versa, using the residual from W3 in a regression on SINGLES ALONE. Including these residuals should purge the other coefficients of contamination by these common unmeasured factors. These regressions are shown in Appendix Table A-3. In both equations, the basic five coefficients are not much affected in magnitude but every variable's t -value increases. The residual's coefficient is positive and significant in both cases and

the adjusted R^2 's rise to 0.92 and 0.73.

Panel B of Table 4 shows the results of using the regression to track the changes in WIDOWS ALONE for the United States from 1950 to 1976. The actual increase was about 40 percentage points while the regressions show a predicted increase of about 30 points, roughly three-quarters of the observed increase, similar to the case of SINGLES ALONE. Decomposing the increase into the part attributable to each variable, the results are:

Implied change 1950-1976 in widows' propensity to live alone (in percentage points)

	<i>Regr. W2</i>	<i>Regr. W3</i>
SSI	33.79	18.24
MOT/DOT	3.48	4.11
MOBILITY	-0.77	-0.68
EDWID	-	3.98
RACE	-	-0.58
Total	36.50	25.07

SUMMARY

In summary, growth in the propensity to live alone appears to be a pervasive phenomenon in the United States in the post-war period. By 1976 more than one out of every ten adults lived alone; among elderly (65+) women the proportion was more than four out of ten and among elderly women without a spouse two out of three.

Among young single men and women, we find rising income to be the principal explanation for this tendency. The income effect is sizable (a mean elasticity of about 1.4), quite stable, and probably responsible for at least three-quarters of the increase in the growth in the propensity to live alone over the past two and one-half decades. The relationship between income and the propensity to live alone is not linear. We find an S-shaped pattern to the relationship implying that as incomes grew from very low levels the impact on

living alone was slight but after some level of income was attained further increases in income have led to a substantial rise in the propensity to live alone. Geographic mobility, educational level, a proxy for liberal social climate, and a low percentage nonwhite also appear to raise the propensity to live alone, but we found no evidence that measures of urbanization, religion (Catholicism) or sex-ratio played a role in the cross-state differences in the propensity for singles to live alone.

Our analysis of elderly widows also suggests that income is a principal determinant of the propensity to live alone, but the partial coefficients on income are not as stable for widows as for young singles. We think the difficulty in adequately measuring the income of elderly widows is the major explanation for the volatility in this partial coefficient. Other variables found to influence the living arrangement of the widows include geographic mobility, a crude measure of the mother/daughter ratio, education and percentage nonwhite. Cross-state regressions for widows are also able to track about 75 percent of the growth between 1950 and 1976 in the propensity to live alone.

The income effect as we have measured it probably incorporates some response to "price" changes. As the number of persons living alone begins to increase significantly, economic and political markets respond in ways that encourage further increases. For example, many kinds of "single portion" food products appear in stores. The construction industry builds more one-bedroom and efficiency apartments. Private and nonprofit institutions arise to provide single housing combined with opportunities for communal dining. Federal, state, and local governments fund emergency and social support services that are particularly valuable to persons living alone. These changes all lower the "price" of living alone and thus reinforce the income effect.

Regarding further work, there is need for more theoretical analysis. In this pa-

per we have employed a consumer demand approach; it may also be useful to consider the changes that have taken place in productive activities within families. For example, the recent decline in fertility may have reduced the usefulness of having grandparents in the home, which may be one further reason for the increased propensity of elderly widows to live apart from their families. Or, the relatively high labor force participation rates of nonwhite women may result in a relatively greater need for grandparents or adult children in the home, which could help explain the observed effect of race. When the living arrangement choice is modeled in the framework of productive efficiency in the functioning of a family, the estimated magnitude and the interpretation of the income effect may be modified.

Also, while we conclude that growth in income raises the propensity to live alone, there is another body of literature which indicates that income is positively related to the propensity to marry (see Becker, 1974; Cutright, 1970; Keeley, 1974; and [weakly] Preston and Richards, 1975) and for men to remain married (see Ross and Sawhill, 1975; and Becker, Landes, and Michael, 1977). Reconciliation of these opposing influences of income on living arrangements would appear to deserve a high priority in subsequent research.

This paper estimates the magnitude and causes of the growth in single-person households, but the repercussions of this growth have not been considered. The impact of growth in single-person households on health levels, on the demand for housing and various social services, and for broader aspects of life-cycle consumption and savings behavior deserves study.

In addition to the growth in single-person households there is also evidence of a substantial growth in the number of single persons who neither live alone nor with families: we note that single, *primary* individuals who do *not* live alone grew from 1 percent of the single population in 1950 to about 10 percent of the single

population by 1976. The evidence on the growth of primary individuals (Kobrin, 1976; Sweet, 1974) appears to combine a sizable growth in both single-person households and households comprised of two or more unrelated individuals. This latter phenomenon also deserves study.

Finally, we note the similarities in approach in this paper and Preston and Richard's (1975) study of marriage rates. In both studies estimated cross-sectional structures (by states in our case, by SMSAs in theirs) perform quite well in explaining, or tracking, recent time series changes. These successes provide grounds for optimism that cross-sectional estimates may prove useful in understanding other demographic changes as well.

NOTE

¹ One possibility is that the variable RACE is acting as a proxy for income dispersion in the state. The income of nonwhites is lower than that of whites, so holding the state's per capita income constant, an increase in the percentage nonwhite reflects an increase in the state's variance in income. If the influence of income on the propensity to live alone is nonlinear, as suggested in subsequent regressions, then an increase in the state's dispersion in income can affect the average propensity to live alone. (Using a measure of the dispersion in income within each state, $SD(\ln Y)$, the standard deviation of log income, we regressed $SD(\ln Y)$ on INCOME and RACE and found a positive coefficient on RACE with a t -statistic = +1.86. Using another measure of per capita income, RACE's effect was stronger ($t = +3.52$). (The dependent variables for these weighted regressions across states were taken from pp. 180-182, Chiswick, 1974.) When $SD(\ln Y)$ is added to regression Y3, it has no effect on other coefficients and a $t < 1.0$, however.)

APPENDIX

Definitions and sources of data for cross-section (c.s.) and time series (t.s.) analysis

SINGLES ALONE AND WIDOWS ALONE: Percent of single persons ages 25-34 and percent of widows age 65+ who live alone estimated from census data. Source: 1950-1970: Census of Population Subject Report/Family Characteristics, 1976 Current Population Report, Series P-20, #306.

INCOME: Real per capita income. c.s.

Per capita income 1967 deflated by a state price index. The income figures are from the U.S. Statistical Abstract. The state price index is based on Fuchs, Michael and Scott, 1979. This particular state price index uses retail sales excluding building materials and food. As discussed in the text several variations were also used and very little difference in coefficients was observed. t.s. Per capita personal income by state from the U.S. Statistical Abstract. (All income measures used in this analysis are expressed in 1967 dollars.)

SSI: Social Security income. c.s. Defined as Social Security survivor's benefits per recipient in 1970, deflated by the state price index. t.s. Average Social Security benefit paid widows and widowers. Source: U.S. Statistical Abstract.

ABORT: Fraction of U.S. population living in states with liberalized abortion legislation. Source: Elaine Rhodenizer of the Family Planning Evaluation Branch, Center for Disease Control, U.S. DHEW. c.s. Dummy variable defined 1 if state had reformed abortion laws. t.s. 1950 = 0; 1960 = 0; 1970 = 0.4 (fraction of U.S. population in states with legalized abortion); 1976 = 1.0 (legal in all states).

MOT/DOT: Ratio of women age 65 + to women ages 35 to 44. Source: Census of Population and U.S. Statistical Abstract.

MOBILITY: For each year defined as the percent who moved into their present home during the present and previous year less the percent who moved into their home more than 20 years prior to the survey year. Source: Census of Population for 1960 and 1970. Estimated for 1950 and 1976 based on information on population moving in the previous year. Source: U.S. Statistical Abstract.

EDUC: Simple average of the percent of men and of women ages 25 to 34 with 4+ years of college education. Source: Census of Population for 1950-1970. Extrapolated from previous census years for 1976.

EDWID: Percent of women ages 65 to 69 with 4+ years of college education.

Source: Census of Population for 1950-1970. Extrapolated from Census data for 1976.

RACE: Percentage nonwhite. Source: U.S. Statistical Abstract.

Estimating the number of persons who live alone in 1950 by age, sex, marital status

We make two assumptions in estimating the number of persons living alone in 1950 by age, sex, and marital status. We assume that the ratio of persons living alone to primary individuals for each age, sex group:

- 1) did not change from 1950 to 1960, and
- 2) is constant across marital status.

Our estimation procedure is a two-phase process. We obtain an initial estimate of the number alone, \hat{A}_i , for age group i , for marital status group j , for sex s , in year 5 (= 1950) from 1950 Census information about the number of primary individuals P in group $sij5$, and from 1960 Census information about A_{s56} and P_{s56} :

$$\hat{A}_{sij5} = P_{sij5} \left[\frac{A_{s56}}{P_{s56}} \right]$$

We then sum across s, i, j to obtain an estimate of the total number of persons living alone $\sum_{sij} \hat{A}_{sij5} \equiv \hat{A}_5 = 4.2$ million. But we know from the 1950 Census of Housing that the total number of single-person households, A_5 , was 4.0 million, so we define an adjustment factor

$$\beta = \frac{A_5}{\hat{A}_5}$$

and use our final estimate

$$A_{sij5}^* = \hat{A}_{sij5} \cdot \beta$$

Estimating SINGLES ALONE and WIDOWS ALONE for 1970 by state

The variable SINGLES ALONE is defined as the proportion living alone of those who are maritally single. WIDOWS ALONE is defined as the proportion of widowed women age 65+ who live alone.

For each state we know:

- A : The number of persons who live alone
 P_{si} : The number of persons who are primary individuals (i.e., who are heads of households but who do not live with other family members), for sex s and age group i
 X_{sij} : The number of persons in the population, for sex s , age i , and marital status j (where j excludes married spouse present)

For the United States as a whole, we know

$$\left[\frac{P}{X}\right]_{sij}^{us} \text{ for 1970,}$$

$$\left[\frac{A}{P}\right]_{sij}^{us} \text{ for 1976, and for 1970 we know}$$

$$\left[\frac{A}{P}\right]_{si}^{us} \text{ for } s = \text{female and } i = 65+.$$

For SINGLES ALONE we estimate $(A/X)_{sij}$ for $i = 25-34$, $j = \text{single}$. For WIDOWS ALONE we estimate $(A/X)_{sij}$ for $s = \text{female}$, $i = 65+$ and $j = \text{widowed}$. We do so as:

$$\left[\frac{\hat{A}}{X}\right]_{sij} = \frac{\left[\frac{\hat{A}}{P}\right]_{sij} \cdot \hat{P}_{sij}}{X_{sij}}$$

We compute \hat{P}_{sij} as:

$$\hat{P}_{sij} = \left[\frac{P}{X}\right]_{sij}^{us} \cdot X_{sij} \div \alpha_{si}$$

$$\text{where } \alpha_{si} = \frac{P_{si}^*}{P_{si}}$$

$$\text{with } P_{si}^* = \sum_j \left[\frac{P}{X}\right]_{sij}^{us} \cdot X_{sij}$$

We compute $(\hat{A}/P)_{sij}$ as:

$$\left[\frac{\hat{A}}{P}\right]_{sij} = \frac{\left[\frac{A}{P}\right]_{sij}^{us}}{\alpha'}$$

where α' is a state-specific adjustment defined as the ratio of the fitted value $(A/P)^*$ for state k to the actual value (A/P) for state k . The fitted value is obtained by weighted-OLS regression across states with the dependent variable $(A/P)_k$ and the five independent variables defined as the proportion of the total population age 25+ (excluding married spouse present) who are male 25 to 34, male 35 to 44, female 25 to 34, female 35 to 44, and female 45+. The regression gives us the variation among states in (A/P) attributable to age and sex, so the ratio α' is a state-specific index used to adjust the $(A/P)_{sij}$ for the United States to a state-specific value.²

¹ \hat{A}_{sij5} was also estimated using 1976 age-sex specific data on individuals and persons living alone at a level of detail not available for 1960. Most of the propensities to live alone from Table 1 were not affected, and those that were differed by less than 1 percentage point.

² We have assumed for SINGLES ALONE that the A/P ratio for never-married men and women did not change between 1970 and 1976. If we drop this assumption and use data on the total number of men and women ages 25-44 who live alone for 1970 we can estimate a sex-specific adjustment factor. Including this adjustment for men and women in the estimate of SINGLES ALONE raises that value for 1970 by one percentage point to 20.5 percent.

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Table A-1.—SINGLES ALONE and WIDOWS ALONE in 1970 by State and Region

	SINGLES ALONE	WIDOWS ALONE		SINGLES ALONE	WIDOWS ALONE
NEW ENGLAND	16.9	46.3	SOUTH ATLANTIC		
Maine	12.3	45.5	(cont'd)		
N.H.	16.6	47.3	N.C.	12.8	42.9
Vt.	18.1	47.5	S.C.	10.9	43.6
Mass.	18.1	46.6	Ga.	15.1	43.1
R. I.	12.2	48.9	Fla.	19.0	52.6
Conn.	17.3	44.7			
			EAST SOUTH CENTRAL	11.2	47.1
MIDDLE ATLANTIC	19.3	47.0	Ky.	10.8	49.9
N.Y.	22.6	49.3	Tenn.	12.6	45.4
N.J.	17.1	43.5	Ala.	10.7	46.5
Pa.	15.4	45.7	Miss.	10.2	47.3
EAST NORTH CENTRAL	19.3	50.9	WEST SOUTH CENTRAL	17.5	52.7
Ohio	18.7	50.8	Ark.	12.6	55.4
Ind.	17.9	55.4	La.	13.7	48.5
Ill.	21.8	50.1	Okla.	19.5	61.6
Mich.	18.3	49.3	Tex.	19.1	51.6
Wis.	18.3	51.0			
			MOUNTAIN	23.0	57.3
WEST NORTH CENTRAL	20.3	56.0	Mont.	23.4	60.5
Minn.	22.4	51.8	Idaho	19.6	62.7
Iowa	19.2	59.2	Wyo.	25.8	64.6
Mo.	19.5	55.2	Colo.	26.3	54.7
N. Dak.	17.3	51.2	N. Mex.	19.3	53.2
S. Dak.	17.4	58.3	Ariz.	21.0	56.1
Neb.	21.9	58.4	Utah	20.6	64.3
Kan.	20.4	59.8	Nev.	30.6	49.7
SOUTH ATLANTIC	16.2	44.7	PACIFIC	28.1	55.2
Del.	20.6	41.2	Wash.	26.8	59.3
Md.	19.3	39.8	Ore.	26.1	59.6
Va.	18.9	40.1	Calif.	29.2	55.4
W. Va.	10.1	50.5	Alaska	24.1	38.1
			Hawaii	15.8	26.9

Table A-2.—Simple Weighted Correlation of 1970 Cross-State Variables for 50 States

	SINGLES ALONE	WIDOWS ALONE	INCOME	SSINC	ABORT	MOT/DOT	MOBILITY	EDUC	EDWID	RACE
SINGLES ALONE	1.00									
WIDOWS ALONE	.53	1.00								
INCOME	.78	.35	1.00							
SSINC	.26	.64	.51	1.00						
ABORT	.46	-.03	.07	-.46	1.00					
MOT/DOT	-.07	.39	.13	.60	-.33	1.00				
MOBILITY	.42	.38	.02	.03	.30	-.26	1.00			
EDUC	.69	.08	.62	-.01	.37	-.06	-.03	1.00		
EDWID	.46	.45	.07	.09	.37	-.19	.70	.20	1.00	
RACE	-.36	-.53	-.48	-.64	.25	-.41	.19	-.30	-.09	1.00
Additional Variables:										
CATHOLIC	.18	-.14	.50	.10	-.21	.19	-.54	.57	-.34	-.37
SMSA	.58	-.02	.68	.07	.17	-.17	-.04	.60	-.12	-.15
SEXRATIO	.45	.48	.19	.27	.18	-.08	.56	.16	.69	-.26

Table A-3.—Selected Regressions on SINGLES ALONE and WIDOWS ALONE

Dependent Variable	Constant	INCOME(2) ^a	ABORT	MOBILITY	EDUC	RACE	\bar{R}^2
SINGLES ALONE	-5.88 (-2.21)	0.56 (5.97)	2.03 (2.89)	0.40 (8.49)	0.14 (0.88)	-0.21 (-5.07)	.84
		INCOME				RESIDUALS FROM W3	
SINGLES ALONE	-15.21 (-6.44)	0.74 (9.62)	2.54 (5.10)	0.26 (8.61)	0.39 (3.81)	-0.11 (-3.47)	.92
		SSINC	MOT/DOT		EDWID	RESIDUALS FROM Y3	
WIDOWS ALONE	12.64 (1.38)	2.37 (2.41)	0.08 (2.55)	0.31 (3.35)	0.71 (1.41)	-0.22 (-2.91)	.73
		INCOME	ABORT		EDUC		
SINGLE MEN ALONE and SINGLE WOMEN ALONE pooled (100 obs.)	-14.62 (-6.42)	0.76 (10.20)	3.11 (6.60)	0.25 (8.47)	0.32 (3.30)	-0.12 (3.86)	.86
SINGLE MEN ALONE and SINGLE WOMEN ALONE pooled (100 obs.) ^b (fully interacted)	-13.87 (-4.31)	0.71 (6.82)	3.78 (5.68)	0.23 (5.49)	0.36 (2.63)	-0.13 (-3.05)	
	MALE	MALE X INCOME	MALE X ABORT	MALE X MOBILITY	MALE X EDUC	MALE X RACE	
	-1.49 (-0.33)	0.08 (0.56)	-1.34 (-1.43)	0.04 (0.72)	-0.08 (-0.41)	0.03 (0.46)	.86

a--INCOME(2) is taken from the Statistical Abstract, defined as the per capita personal income by state (expressed in 1967 dollars).

b--An F-test on the six male coefficients yielded $F_{6, 98}=1.03$ with a critical value of 2.21 for $\alpha=.05$.