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INCOME DISTRIBUTION, HAPPINESS AND
SATISFACTION: A DIRECT TEST OF
THE INTERDEPENDENT PREFERENCES MODEL

by

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ABSTRACT

This paper utilizes social-psychological measures of happiness and satisfaction in order to test the interdependent preferences model. According to this class of models, in addition to individual characteristics, utility also depends on the well-being of other members of society. Happiness and satisfaction should therefore depend on the average income of society and its distribution among rich and poor. Canadian survey data are used to test this hypothesis. Results differ across alternative measures of subjective well-being. Holding personal characteristics constant, self-reported satisfaction is lower the larger the share of income going to the poorest 40% of the community. A 3-point scale of happiness yields similar results, but not an 11-point scale. The determinates of satisfaction and happiness differ systematically between men and women. Overall, the empirical results support the interdependent preferences model, but defy any simple characterization in terms of inequality aversion and relative economic status.

I. INTRODUCTION

The founding fathers of economics (Bentham, Edgeworth, Marshall, Smith, etc.) emphasized social interactions as important determinants of utility. An individual's satisfaction was supposed to depend not only on his own consumption of goods and services, but also on the status, reputation and distinction accorded to him by others. Interactions between individuals in their pursuit of prestige have been repeatedly emphasized by sociologists (Blau, Durkheim, Simmel, Parsons and Veblen). For the most part, however, economists omit the characteristics of others as determinants of satisfaction and consider an isolated individual who derives utility solely from the direct consumption of goods, services and leisure. This approach may be adequate for many problems; however in analyzing family decision-making, charitable contributions, participation in volunteer work, and the determinants of government transfer programs, this approach may be seriously misleading. In order to analyze such questions economists have formulated models of interdependent (or 'extended') preferences, in which the well-being of others enters, positively or negatively, as an argument in the utility function (e.g., Becker, 1974; Gregory, 1980; Hochman and Rodgers, 1969; Roberts, 1984; Schall, 1972; Scott, 1972; Thurow, 1971). In this context a number of interesting questions arise: does the well-being of others enter positively or negatively in the utility function of the typical individual? Are individuals altruistic or envious? Intrafamily transfers, charitable donations, participation in volunteer activities and government redistribution programs may be motivated by an altruistic concern for others. On the other hand, criminal actions in general, and crimes such as assault and murder in particular, suggest that malice, envy and hatred may also

be motivating factors. Moreover, the emphasis placed by sociologists on the desire for distinction and prestige suggests a negative dependence of utility on the status of others. Second, how important are the characteristics of others, relative to own consumption, in determining utility? Is the neglect of interdependent preferences by economists justified? Certainly a diversity of views exists. Adam Smith considered envy and hatred as minor motivations, whereas for Veblen these were the very staff of human life.¹ Casual empirical evidence is mixed. Charitable contributions appear small relative to GNP: in the U.S. in 1958-59, itemized tax-deductible charitable donations amounted to only 4% of gross income and charitable bequests amounted to only 5% of large estates (Vickrey, 1962). However the fact that the majority of households do not contribute to charity may reflect the free-rider problem resulting from the public good nature of charitable giving. Many individuals may be at a corner solution in which charitable donations are zero, while at the same time the well-being of others enters as a significant determinant of their own satisfaction (Roberts, 1984). Government transfers are sizeable, in 1973-74 transfers amounted to 11% of GNP in the U.S. and averaged 18.8% in 16 OECD countries (Peltzman, 1980, p. 213). Such transfers may reflect altruism on the part of the median voter (Hochman and Rodgers, 1969), but could also reflect the interests of various pressure groups (Becker, 1983). Criminal activity apparently accounts for a minor fraction of GNP, however avarice and anger, in their more refined expressions, may be of greater importance. At the present time we know little regarding the

importance of altruism and benevolence, or envy and hatred. As Gary S. Becker has said: "In principle, the importance of envy and hatred can be measured... unfortunately, not enough information is available...to make even crude estimates of the relative contribution of envy and hatred." (Becker, 1974, p. 1089.)²

The purpose of this paper is to utilize self-reported measures of happiness and satisfaction in order to estimate the importance of altruism and envy. Subjective measures of well-being of this type have been utilized by social psychologists for some time (see, e.g., Cantril, 1965; Bradburn, 1969; Bradburn and Caplowitz, 1965; Gurin et al, 1960), and have occasionally been employed by economists (e.g. Easterlin, 1973, 1974; Morawetz et al, 1977; Keller and Wansbeek, 1983; Simon, 1974). In the empirical research reported here, measures of happiness and satisfaction are related to the individual's characteristics (income, education, age, location, etc.) and the characteristics of the community in which the individual resides (average income and the income shares of the rich and poor). Under the maintained hypothesis that self-reported happiness and satisfaction measure utility, we examine the influence of the income of others and its distribution on reported well-being and thus test the interdependent preference model.

The following section outlines a model of interdependent preferences. Section III describes the data and variables employed. Empirical results are reported in Section IV and the paper concludes with a brief summary.

II. A MODEL OF INTERDEPENDENT PREFERENCES

The interdependent utility model has been adequately presented in the literature (see, e.g., Becker, 1974). The central tenant is that, in addition to own consumption of goods and leisure, utility also depends on the perceived well-being of other individuals as measured by either their utility, income, or consumption, etc. If utility is the relevant characteristic of others we can write the utility function of individual i ($i=1, \dots, N$) as:

$$U_i = U_i(z_i, U_j), \quad \frac{\partial U_i}{\partial U_j} \neq 0 \quad \text{for some } j \neq i \quad (1)$$

where z_i is the consumption of goods and leisure by individual i . In general U_j is a vector of the utilities of other individuals ($j=1, \dots, N$; $j \neq i$) in the society and this component of i 's utility function could be viewed as his "social welfare function". The signs of the derivatives of U_i wrt U_j indicate whether i is altruistic (positive derivative) or envious (negative) of individual j .

An interesting special case arises if the utility function (1) is additively separable:

$$U_i = u_i(z_i) + \sum_{j=1}^N \delta_{ij} U_j \quad (2)$$

where δ_{ij} is Edgeworth's 'coefficient of effective sympathy' (or envy if $\delta_{ij} < 0$) (see Collard, 1975), denoting the weight attached by i to the well-being of other individuals in his utility calculus. The importance attached to the utilities of other individuals would be expected to depend on their genetic and family relationship, and the extent of their physical and social interaction (Becker, 1974; Edgeworth; Pauly, 1973).

Each individual maximizes utility subject to a budget constraint, which is assumed to be linear:

$$I_i + \sum_{\substack{j=1 \\ j \neq i}}^N e_{ji} = z_i + p \sum_{\substack{j=1 \\ j \neq i}}^N e_{ij}$$

where I_j is the income of individual i ; e_{ij} measures the contribution of i to j 's consumption, which may be either positive or negative depending on whether i is altruistic or envious; p is the (constant) cost of augmenting or depleting j 's resources by one unit. For simplicity we assume that the costs of charitable and predatory behavior are symmetric, differing only in sign, i.e., $p \geq 0$ as $e_{ij} \geq 0$.

This model is capable of generating both charitable and predatory behavior (see Becker, 1974). In the present context, however, corner solutions are likely to be of considerable importance. For example, if individual i is altruistic towards all other individuals and given \$1:\$1 transfers ($p=1$), under Edgeworth's proposition that the 'coefficient of effective sympathy' is less than unity (see Collard, 1975), individual i would only make charitable contributions to individuals with lower incomes. With respect to all individuals with equal or higher incomes i will be at a corner solution making zero charitable contributions; i 's altruism would be latent. Nevertheless, with non-zero cross derivatives, i 's utility would still be influenced by an exogenous change in the incomes of such individuals. The importance of this case is likely to be compounded by the free-rider problem resulting from the public-good nature of charitable donations in this type of model. Similar considerations apply to predatory behavior arising from envy.

The model outlined above implies a dependence of utility on one's own income and the distribution of incomes in society. To make this relationship transparent, consider a society of N individuals with identical utility functions (2), all of whom are at a corner solution with respect to charitable and predatory behavior. A Taylor-series expansion of (2) about mean income \bar{I} gives:

$$\begin{aligned}
 U_i = & u_i(I_i) + \sum_j \delta_{ij} U_j(\bar{I}) + U'(\bar{I}) \sum_j \delta_{ij} (I_j - \bar{I}) \\
 & + \frac{1}{2} U''(\bar{I}) \sum_{jk} \delta_{ij} (I_j - \bar{I})(I_k - \bar{I}) + \text{higher order terms}
 \end{aligned}
 \tag{3}$$

If all individuals attach equal weight to the utilities of other members of society ($\delta_{ij} = \delta$, all ij) the third term vanishes and the fourth term reflects the variance and covariances of incomes. Thus individual utility would depend on own income ($I_i = z_i$), the mean income of society (\bar{I}), its variance, covariance and higher order moments. An increase in mean income, holding own income constant, would raise (lower) the utility of an altruistic (envious) individual. The fourth term reflects the interaction between inequality, a mean-preserving increase in the variance of incomes (other things equal) would lower (raise) utility of altruistic (envious) individuals. This corresponds to the case considered by Thurow (1971) in which the income distribution is a pure public good.

If individual i attaches different weights to others according to genetic, geographic or social distance, then the third term need not vanish, since individual i would be concerned as to the identity of

individuals above and below the mean. Also the fourth term wouldn't simply be the variance and covariance. In this case we can write $\delta_{ij} = \bar{\delta} + d_{ij}$ where $\bar{\delta}$ is the mean weight attached by individual i to the utilities of others and d_{ij} is the deviation from $\bar{\delta}$. Substituting into (1)", U_i would depend on mean income (\bar{I}), its variance and higher moments, plus other terms reflecting the correlation between i 's social welfare weights and the location of individuals in the distribution of income.

III. EMPIRICAL SPECIFICATION

The sparsity of data on both benevolent and predatory behavior and the possibility that latent altruism and envy may be of considerable importance suggest that a direct test of the interdependent utility model should be attempted. The tests conducted here employ self-reported measures of happiness and satisfaction developed by social psychologists.³ (Cantril, 1965; Cambell et al, 1976.) For each of these measures respondents ranked themselves on an eleven-point scale. The use of these scales as measures of utility requires the assumption that utility is both cardinal and interpersonally comparable. Of course these are strong assumptions. However, the assumption of cardinality (up to a linear transformation) is routinely made in the use of von Neumann-Morgenstern utility functions to analyze a broad class of decisions under uncertainty. Moreover, the 'standard' model of interdependent preferences (Becker, 1974, esp. p. 1081) assumes that interpersonal comparisons of utility are, in fact, being made. In the model of the previous section, altruistic individual i , in considering whether to donate \$1 to individual j or

individual k is assumed to evaluate the relevant marginal utilities. Alternatively, given his coefficient of effective sympathy, individual i may decide that the marginal utility of own consumption is higher than that of either j or k.⁴

Social psychologists have examined the reliability and correlates of measures of happiness. They conclude that such measures have reasonable test-retest reliability (Wilson, 1967). Psychologists have restricted their analysis to correlations with one or a few variables. Wilson summarizes their findings: "The happy person emerges as a young, healthy, well-educated, well-paid..., married person,... of either sex..." (p. 294).

Economists have on occasion analyzed psychological measures of happiness and satisfaction. Easterlin (1973, 1974) examined the relation between income and happiness. Keller and Wansbeek (1983) performed a multivariate analysis of satisfaction and happiness using canonical regression techniques. Using data from the Netherlands they found significant relationships between these variables and schooling, income, marital status and labour force status. Other things constant, well-being increased with household income and was inversely related to schooling. Neither of these studies test the interdependent utilities model.⁵ The singular attempt at such a test using psychological measures of happiness is the study by Morawetz et al (1977). Morawetz et al conducted a 'pilot study' of two Israeli communities, one of which was characterized by equality in incomes. Holding other things constant, the

authors found reported happiness to be higher in the community characterized by equality. However, there are a number of reservations with this study. First, this study was restricted to two communities which differ in both average income, inequality and other dimensions. Hence it is not possible to identify the separate effects of differences in average incomes, inequality and other factors. Second, the study produced some anomalous results. In particular the authors found a significant negative relationship between income and reported happiness, contrary to earlier studies (Bradburn and Caplowitz, 1965; Wilson, 1967).

The present study extends the work of Morawetz *et al* by expanding the list of individual characteristics and incorporating data on several hundred 'communities'. The data derive from the 1977 Quality of Life Survey of Canadian households.⁶ The individual characteristics analyzed include income, education, age, sex, marital status, child status, health, religion, activity status, location (urban/rural and province/region) and family background.⁷ These variables are described in more detail in Table 1. The aggregate community characteristics are important variables. This survey identifies the Federal Electoral District in which the individual was located in 1977. We have obtained from the 1971 Canadian Census information on the income distribution in each electoral district. The use of aggregate data at the Federal Electoral District level assumes that the individual's society or 'reference group' corresponds to this aggregate. To the extent that it does not we would expect the coefficients on the aggregate income distribution variables to be biased towards zero. For each district we have computed the average income and the shares of the bottom 40% and top 10% of individuals in 1970 aggregate income.⁸ Thus we can include not only the mean income, but also measures of the 'spread' in the income distribution as suggested by equation (3) above. The signs

and statistical significance of these three variables constitute our test of the interdependent utility model. The conventional criterion for statistical significance is the 5% level using a one-tailed t-test (t statistic ≥ 1.96). A less strict criterion would be significance at the 10% level ($t \geq 1.645$). If none of the income distribution variables are statistically significant as determinants of happiness and satisfaction, we cannot reject the purely individualistic model which excludes extended preferences. Conversely if, after controlling for individual characteristics, average income and the share of the poor are significantly positive and the share of the rich significantly negative, this would suggest that individuals are altruistic and also have an aversion to income inequality in their locality. Other results would have different interpretations.

IV. EMPIRICAL RESULTS

Empirical results using Ordinary Least Squares regression techniques are reported in Table 2. Consider first the regressions reported in columns (1) and (2). Of the three variables which describe the aggregate income distribution--average income and the shares of the poor and rich--only one is significant at the 5% level (SHARE POOR) and only in the satisfaction regression (column (1)). Thus if we had restricted our attention to the measure of happiness we would conclude that utility depends only on individual characteristics and is independent of the aggregate income distribution in the individual's locality. In contrast the results reported in column (1) support the interdependent utility model, although the coefficients are somewhat surprising. The coefficient on the share of the poor is negative and significantly different from zero

at the 2% level ($t=2.34$). Holding an extensive list of personal attributes constant, individuals residing in communities where the poor have a larger share of total income report lower values of satisfaction. Quantitatively, an increase of 10% in the share of the poor reduces satisfaction by approximately 0.6 of a point. In order to maintain satisfaction unchanged, own income would have to be increased by \$4,200 for every 1% increase in the share of the poor. Viewed from this perspective the interdependence implied by this coefficient is substantial. In terms of the underlying theoretical model this result implies that individuals are not averse to income inequality among other members of their society, but on the contrary are 'inequality lovers', at least with respect to inequality in the lower tail of the income distribution. One possible explanation is that individuals are envious and possess 'Rawlsian' preferences, evaluating their economic success relative to the economic status of the poorest segment of society. Under these circumstances, holding own income and the average income of society constant, individuals would prefer to see an increase in income inequality among their fellows, since this would lower the income of the poor and hence increase the satisfaction of the envier.

The remaining variables can be briefly discussed. Both own income and the income of other household members enter with positive coefficients which are not significantly different from each other.⁹ Age and its square both enter with significant coefficients which imply a U-shaped relationship between satisfaction or happiness and age. Equation (1) implies that, other things equal, satisfaction reaches a minimum at age 41, approximately the sample mean. On the other hand, reported happiness reaches a minimum at age 25, so for most individuals in the sample, happiness is increasing with age. We find a significant sex

differential with females ranking higher in both satisfaction and happiness. Education is not significant. These results contrast with the previous bivariate relationships discussed in the social psychological literature (Bradburn and Caplowitz, 1965; Wilson, 1967). Comparing the impact of individual characteristics on the two scales we find that many variables have essentially the same impact--income, health, labour force status (UNEMPL, STRIKE/LAYOFF). On the other hand, some characteristics have effects which differ in magnitude on the two measures--age, marital status, and retirement. Quantitatively, the variables with the largest impact on either measure of well-being are poor health and being on strike or layoff. The set of regressors explain 14-15% of the variance in both satisfaction and happiness.

The remaining regressions in Table 2 examine the robustness of these empirical results. Columns (3)-(6) relax the assumption that all individuals have identical utility functions by allowing for heterogeneity in the constant terms. We do this by introducing the individual's perception of the happiness of the average Canadian as an additional regressor. Columns (3)-(4) introduce Average Happiness as a continuous variable, while in columns (5)-(6) this variable is introduced as a series of dummy variables. In each case this variable is highly significant. Individuals who perceive the well-being of the average Canadian to be high, also report higher levels of personal satisfaction and happiness. On the one hand this may reflect an altruistic concern for others extending beyond one's immediate locality. However it could also reflect the fact that individuals differ in their optimism/pessimism regarding both the well-being of others and themselves.¹⁰ Whatever the interpretation, the important result is that

controlling for this source of heterogeneity leaves the previous conclusions unaffected. The share of the poor continues to enter with a statistically significant in the satisfaction regressions [columns (3) and (5)], and its coefficient is unchanged. The variable most affected is the coefficient on education which now enters with a positive coefficient that is statistically significant at the 8% level ($t = 1.75$) in the happiness regression [column (6)].

The regression results reported thus far constrain the effect of income on satisfaction and happiness to be linear. We have experimented with Box-Tidwell power transformations of the income variables. We found only limited evidence of non-linearities. Satisfaction was found to be linear in both income variables. Happiness increased linearly with own income, but was a non-linear function of other income. $\text{OTHER INCOME}^{\text{exp. (.875)}}$ fit the data better than the level of other income--implying a diminishing marginal effect--however the change in R^2 was trivial.¹¹

We have also experimented with alternative transformations of the dependent variables. Of the Box-Cox class of transformations, the levels of satisfaction and happiness [reported in columns (1)-(6)] produced the smallest residual sum of squares. An alternative, more flexible approach following Keller and Wansbeek (1983), is to code the dependent variables into a series of dummy variables and to use canonical correlation to determine the coefficients of a step function to rescale the measures of happiness and satisfaction. The resulting canonical coefficients are graphed in Figure 1. The important point is that over the range which includes the majority of observations (6-10 on the original scales) the

INSERT FIG 1. ABMT HERE

canonical coefficients are monotonically increasing in a roughly linear pattern. As might be expected given this finding, the regression results [columns (7)-(8)] using the canonically sealed dependent variables yield results that correspond closely to those presented earlier.¹² The share of the poor continues to have a significant negative impact on satisfaction [column (7)].

Additional Results

In order to obtain further insights into the determinants of happiness and satisfaction the sample was partitioned according to various criteria: income, location and sex. The most striking differences arose between males and females. The coefficients on selected variables are reported in Table 3. Consider first the three variables which characterize the aggregate income distribution. For males the share of the poor enters negatively in both the satisfaction and happiness regressions, with coefficients which are statistically significant at the 8.5% and 7.5% levels, respectively. For females this variable is never significant, at the 10% level. A further contrast exists in the relationship between average income and the reported happiness of men and women. For males, other things equal, an increase in average income increases happiness. Further, the coefficient on average income is sizeable relative to that on own income, and statistically significant at the 1% level. In contrast, for females an increase in average income reduces reported happiness [column (4)], although the coefficient is only significant at the 9% level.¹³ Thus, looking at the impact of average income in reported happiness, males appear to be altruistic and females envious. On the other hand, concentrating on the coefficient on the share of the poor, males

appear to be 'inequality lovers', whereas females are neither inequality lovers nor inequality averse. Turning to the influence of individual characteristics, it appears broadly true that the well-being of males is more influenced by labour market outcomes (OWN INCOME, UNEMPL) than that of females. On the other hand marital status and child status variables (PRESCHOOL) appear to have larger effects for females. We leave it to the reader to decide whether these differences accord with intuition.

In addition to the measures of well-being analyzed thus far, these data also contain a 3-category happiness scale in which respondents designated themselves as 'very happy', 'fairly happy', or 'not too happy'. (Percentage responses were: 50.5%, 45.5% and 4%, respectively.) In order to examine the robustness of the previous empirical results, this alternative measure of happiness was analyzed using maximum likelihood probit techniques. Table 4 reports the results of this exercise. As before, the share of the poor is a significant determinant of the probability of being 'very happy' [columns (2) and (4)]. Evaluated at the mean, a 1% increase in the share of the poorest 40% of the population reduces the probability of being very happy by 1.45 percentage points. The probability of being 'not too happy' is independent of the share of the poor [columns (1) and (3)]. More surprising, given the previous results, is the finding that the share of the rich is negative and statistically significant at the 5% level in columns (1) and (3) and the 7.5% level in columns (2) and (4). Other things equal, a 1% increase in the share of the rich

increases the probability of being 'not too happy' by 0.13 of a percentage point, and reduces the probability of being 'very happy' by half a percentage point, when evaluated at the mean. In order to maintain the probability of being very happy unchanged, each 1% increase in the share of the rich would need to be accompanied by an increase in other income of approximately \$1500. The fact that both the shares of rich and poor enter with negative signs implies that individual preferences cannot be simply designated as inequality averse; an inward movement of the Lorenz curve caused by increasing the share of the poor and reducing the share of the rich would have an ambiguous effect on this measure of happiness. These results suggest that, holding personal characteristics constant, reported happiness is increased by one's economic achievement relative to the poor, but is decreased by the economic progress required to attain the upper tail of the income distribution.

V. CONCLUSIONS

The goal of this paper has been to conduct a direct empirical test of the interdependent utilities model. The central tenant of this class of models is that, in addition to an individual's own characteristics, utility also depends on the characteristics of other members of society. The tests conducted here are 'direct' in the sense that they rely on subjective measures of well-being developed by social psychologists, rather than objective measures of altruistic behavior such as charitable contributions. Strong assumptions are required to use such measures as proxies for utility. Using survey data for Canada we examined whether self-reported happiness and satisfaction are influenced by the distribution of income in the community where the individual resides. The empirical results provide strong support for the interdependent utilities model: the parameters

of the local income distribution are significant determinants of well-being. The most consistent finding is that the income share of the poorest 40% of the population has a negative impact on satisfaction (Table 2) and happiness (Table 4). This result is surprising in that it is contrary to the view that individuals have an altruistic aversion towards income inequality in their community (Thurow, 1971), and contrary to the results of Morawetz et al (1977). On the other hand, we also find using a three-category measure of happiness, that subjective well-being is negatively related to the income share of richest 10% of the population (Table 4). Taken together, these results suggest a certain asymmetry in the response of individuals to inequality in the upper and lower tails of the income distribution, so that it may not be possible to characterize individual preferences in terms of a single inequality aversion parameter. A further puzzle concerns differences between the sexes. Other things equal, we found that an increase in the average income of the community raised the reported well-being of males, but reduced that of females. Perhaps this study has raised more questions than it has answered, nevertheless we hope to have provided some empirical support for the interdependent utilities model. Further empirical research on this topic appears promising.

Footnotes

¹Smith wrote "Envy, malice, or resentment, are the only passions that can prompt one man to injure another in his person or reputation. But the greater part of men are not very frequently under the influence of these passions, and the very worst men are so only occasionally" (Smith, 1937). On the other hand, Veblen considered that "the desire for wealth can scarcely be satiated...no general increase of the community's wealth can make any approach to satiating the need, the ground of which is the desire of everyone to excel everyone else in the accumulation of goods" (Veblen, 1934, p. 32) (quotations from Becker, 1974).

²See also Thurow (1971, pp. 335-6) for a call for empirical research on the effects of income distribution on individual wellbeing.

³The leading intermediate economic theory texts identify utility with satisfaction and/or happiness: "The technical name for measures of consumer satisfaction is utility. The words utility, satisfaction, welfare, happiness and wellbeing are more or less synonymous" Call and Holahan (1983, p. 29). "Utility is the satisfaction that an individual receives from the various activities he or she pursues" Nicholson (1978, p. 50). "When we talk about how much satisfaction a consumer gets we mean utility" Miller (1982, p. 39). See also the quotations in Easterlin 1974 p. 90, fn. 2.

⁴Harsanyi (1975) argues that "in everyday life we make or at least attempt to make, interpersonal utility comparisons all the time. ...we give a book or a concert ticket...to one friend rather than another in the belief that the former would enjoy it more than the latter would" (p. 638). Comparisons of this type require that marginal utilities be interpersonally comparable, that

is, utility functions are unique up to an additive constant. The use of the scales developed by social psychologists require the additional assumption that the constant terms are also identical. In our empirical work we make some allowance for heterogeneity in the intercept terms. [See Sen (1970) for a discussion of different types of comparability.]

⁵Easterlin (1974) considers the evidence consistent with a "Duesenberry-type model, involving relative status considerations as an important determinant of happiness" (p. 118), but does not directly test this model against the data.

⁶Atkinson (1980) presents a brief analysis of satisfaction measures in these data, concentrating on the effects of income and age on general life satisfaction. He concludes that satisfaction is positively correlated with both income and age.

⁷Several variables were eliminated at a preliminary stage of the analysis since they systematically failed to achieve statistical significance by a wide margin. For example, no French/English language differences were found.

⁸There are 264 Federal Electoral Districts in Canada with an average population of 82,000 (1971). Approximately 200 districts are represented in these data. In principle there are an infinite number of income inequality measures. The two employed here were chosen because of ease of computation; we have not experimented with alternative measures.

⁹This implies that a redistribution of income among family members would leave happiness and satisfaction unchanged. This is consistent with Becker's theorem regarding 'the unimportance of the distribution of income' (p. 1077) that "If one member cares sufficiently about all other [family] members to transfer general resources to them, redistribution of income among members would not affect the consumption [and hence utility] of any member" (p. 1076). Note, however, that this prediction ignores the opportunity cost of time. If own income is derived mainly from wage income, an increase in own income would produce a smaller change in utility than an equal increase in other income, since it raises the opportunity cost of own leisure time.

¹⁰The self-reported health status variables may also be interpreted as controlling for heterogeneity to the extent that individuals with a favourable (unfavourable) evaluation of their physical health also tend to have a favourable (unfavourable) evaluation of their mental health as measured by happiness or satisfaction.

¹¹Since estimated coefficients differ only marginally from those in Table 2, they are not presented here.

¹²Since the canonical coefficients are normalized, the regression coefficients in columns (7)-(8) are not comparable with those reported in columns (1)-(6).

¹³One might argue that the average income variable might capture cost-of-living differentials between locations. This would lead us to expect the average income variable to enter with a negative sign. The pronounced sex differential in the impact of AVERAGE INCOME is inconsistent with this interpretation. Note also that the regressions include a set of province/region and urban/rural variables which would capture some of the cost-of-living differentials.

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Table 1. Definitions of Variables

<u>VARIABLE</u>	<u>DEFINITION</u>	<u>MEAN</u>
I. <u>Community Characteristics 1970</u>		
AVERAGE INCOME	Mean 1970 Income of individuals 15+ in the Federal Electoral District in which individual resides (\$000's).	3.860
SHARE POOR	Share of the bottom 40% of individuals 15+ in the aggregate income of the Federal Electoral District.	3.11%
SHARE RICH	Share of the top 10% of individuals 15+ in the aggregate income of the Federal Electoral District	36.62%
II. <u>Individual Characteristics</u>		
SATISFACTION	Individual's ranking of satisfaction with life (1: Completely dissatisfied; 7: Neutral; 11: Completely satisfied).	8.63
HAPPINESS	Individual's ranking of present life happiness (1: low; 11: high).	8.15
AVE HAPPINESS	Individual's ranking of the happiness of the average person living in Canada (1: low; 11: high)	7.00
OWN INCOME	Personal Income in 1976 (\$000's).	8.60
OTHER INCOME	Income of other family members (= Total Family Income - Personal Income) in 1976 (\$000's).	8.27
AGE, AGESQ	Age and its square.	42.12
SEX *	FEMALE: 1 is sex of respondent is female, 0 if male	59.20%
EDUCATION	Highest level of education achieved.	11.22
MARITAL STATUS*	MARRIED: Married or common law (66.61%); WIDOWED: Widowed (8.42%); DIVORCED/SEPARATED: divorced or separated (6.83%); reference group is single (never married).	
CHILD STATUS	NUMCHILD: Number of children (0 for never married). PRESCH:* One or more preschool children (< 6).	1.95 25.16%
HEALTH*	(a) Self-reported health status: EXCEL: Excellent (17.48%); V.GOOD: Very Good (35.97%) GOOD: reference group; FAIR (13.90%); POOR (2.85%). (b) Self-reported health problems: VSERIOUS: 1 if health problem is very serious (6.95%) reference group: no health problem, not very serious or fairly serious.	
RELIGION *	RCATH: Roman Catholic (47.23%); RPROT: Protestant - reference group; ROTHER/NONE: No religion or other non Catholic/Protestant religion (Greek Orthodox, Jewish, eastern religion, etc.) (13.56%).	
ACTIVITY STATUS *	UNEMPLOYED (3.31%); STRIKE/LAYOFF: currently on strike or layoff (0.61%); SELF: Self employed (6.24%); RETIRED (8.69%).	

Table 1 (continued)

<u>VARIABLE</u>	<u>DEFINITION</u>	<u>MEAN</u>
LOCATION*	(a) Province/Region: ATLANTIC: Atlantic Provinces (Newfoundland, New Brunswick or Prince Edward Island) (11.60%); QUEBEC (32.94%); ONTARIO - reference group; PRAIRIE: Prairie Provinces (Manitoba, Saskatchewan or Alberta) (11.14%); BC: British Columbia (10.16%)	
	(b) Urban/Rural: METRO: Census Metropolitan Area (66.54%); SMALL URBAN: Population 10,000-100,000 - Reference group ; TOWN: Population 1,000-10,000 (5.20%); RURAL: Population less than 1,000 and rural area (17.94%).	
FAMILY BACKGROUND	FATHER'S ED: Highest level of education achieved by Father	9.05
	MOTHER'S ED: Highest level of education achieved by Mother	9.05

Notes to Table 1:

- The questions used to ascertain satisfaction and happiness were as follows: (a) SATISFACTION: "All things considered, how satisfied or dissatisfied are you with your life as a whole? Which number comes closest to how you feel?" (b) HAPPINESS: "Here is a picture of a ladder. At the top of the ladder is the best life you can imagine--the ideal life. At the bottom of the ladder is the worst life you can imagine. Where on the ladder would you place your present life?" (c) AVE HAPPINESS: (with reference to the Happiness scale) "Where on the ladder would you place the life of the average person living in Canada?"
- The correlations between these measures are (i) (a) and (b): 0.571; (ii) (b) and (c): 0.154; (iii) (a) and (c): 0.076 (n = 3267).
- Means are defined over the number of individual observations in the sample (n = 3267).
- * denotes set of dummy variables (reference group indicated in table).

Table 2: Determinants of Happiness and Satisfaction

Reg. No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var:	Satisfaction	Happiness	Satisfaction	Happiness	Satisfaction	Happiness	Satisfaction	Happiness
AVERAGE INCOME	-0.00123 [0.322]	0.00057 [0.165]	-0.0012 [0.314]	0.00061 [0.179]	-0.00157 [0.411]	0.00014 [0.040]	-0.00028 [0.467]	0.00024 [0.440]
SHARE POOR	-0.0577 [2.339]	-0.0267 [1.199]	-0.0572 [2.324]	-0.0247 [1.124]	-0.0583 [2.364]	-0.0255 [1.163]	-0.0097 [2.504]	-0.0016 [0.456]
SHARE RICH	-0.00551 [0.609]	0.0057 [0.695]	-0.0059 [0.654]	0.0047 [0.585]	-0.0065 [0.716]	0.0042 [0.525]	-0.0012 [0.840]	0.00012 [0.092]
AVE HAPPINESS	--	--	0.1069 [5.013]	0.1997 [10.507]	dummies	dummies	dummies	dummies
OWN INCOME	0.0137 [3.038]	0.0152 [3.729]	0.0138 [3.071]	0.0152 [3.803]	0.0138 [3.059]	0.0150 [3.752]	0.0021 [2.965]	0.0025 [3.977]
OTHER INCOME	0.0088 [2.777]	0.0103 [3.590]	0.0095 [3.015]	0.0116 [4.111]	0.0094 [2.967]	0.0114 [4.037]	0.0015 [2.986]	0.0020 [4.524]
AGE	-0.0780 [6.074]	-0.0262 [2.258]	-0.0764 [5.973]	-0.0232 [2.030]	-0.0773 [6.033]	-0.0228 [1.997]	-0.0119 [5.889]	-0.0031 [1.715]
AGESQ	.00095 [6.948]	.00052 [4.184]	.00094 [6.885]	.000495 [4.073]	.00095 [6.935]	.00049 [4.027]	.000148 [6.862]	.00007 [3.667]
FEMALE	0.1923 [2.557]	0.2844 [4.188]	0.1829 [2.440]	0.2678 [4.009]	0.1846 [2.462]	0.2699 [4.039]	0.0380 [3.214]	0.0434 [4.123]
EDUCATION	0.0002 [0.015]	0.0132 [1.1338]	0.0033 [0.254]	0.0187 [1.627]	0.0048 [0.370]	0.0201 [1.750]	-0.0017 [0.815]	0.0052 [2.856]
MARRIED	0.6037 [5.808]	0.3738 [3.983]	0.6068 [5.858]	0.3805 [4.122]	0.5955 [5.744]	0.3727 [4.035]	0.1046 [6.402]	0.0669 [4.800]
DIVORCED/SEPARATED	-0.0494 [0.326]	-0.2139 [1.562]	-0.0529 [0.350]	-0.2196 [1.630]	-0.0498 [0.330]	-0.2136 [1.5859]	0.0172 [0.724]	-0.0143 [0.675]
WIDOWED	-0.0088 [0.056]	-0.5809 [4.064]	-0.0063 [0.040]	-0.5802 [4.125]	-0.0156 [0.0988]	-0.5850 [4.158]	0.0103 [0.415]	-0.0701 [3.159]
NUMCHILD	0.0046 [0.238]	-0.0043 [0.247]	0.0071 [0.374]	0.0005 [0.031]	0.0067 [0.351]	0.0001 [0.0005]	0.0006 [0.198]	0.0014 [0.517]

(Table 2 continues next page)

Table 2: (Continued)

Reg. No. Dependent Var:	(1) Satisfaction	(2) Happiness	(3) Satisfaction	(4) Happiness	(5) Satisfaction	(6) Happiness	(7) Satisfaction	(8) Happiness
PRESCHOOL	-0.178 [2.224]	-0.1414 [1.962]	-0.1720 [2.161]	-0.1314 [1.853]	-0.1738 [2.185]	-0.1325 [1.869]	0.0305 [2.435]	-0.0204 [1.826]
HEALTH EXCEL	0.6867 [7.224]	0.6778 [7.897]	0.6717 [7.085]	0.6531 [7.729]	0.6630 [6.989]	0.6468 [7.651]	0.1225 [8.193]	0.1036 [7.779]
V GOOD	0.2926 [3.770]	0.2943 [4.199]	0.2828 [3.655]	0.2767 [4.013]	0.2862 [3.693]	0.2791 [4.041]	0.0585 [4.792]	0.0510 [4.681]
FAIR	-0.6539 [6.239]	-0.4374 [4.621]	-0.6589 [6.304]	-0.4433 [4.761]	-0.6569 [6.2829]	-0.4417 [4.741]	-0.0962 [5.836]	-0.0531 [3.615]
POOR	-1.6238 [7.625]	-1.7846 [9.281]	-1.6636 [7.834]	-1.859 [9.822]	-1.6369 [7.691]	-1.8270 [9.633]	-0.1839 [5.480]	-0.1826 [6.109]
V SERIOUS	-0.1982 [1.407]	-0.0669 [0.526]	-0.2017 [1.437]	-0.0728 [0.582]	-0.2137 [1.521]	-0.0841 [0.672]	-0.0030 [0.135]	-0.0148 [0.749]
RCATH	0.0493 [0.604]	0.0514 [0.697]	0.0434 [0.534]	0.0409 [0.564]	0.0329 [0.4034]	0.0332 [0.458]	0.0082 [0.638]	0.0030 [0.261]
ROTHER/RNONE	-0.3992 [4.007]	-0.2319 [2.579]	-0.3941 [3.966]	-0.2174 [2.455]	-0.3980 [4.003]	-0.2210 [2.495]	-0.0466 [2.975]	-0.0229 [1.641]
UNEMPL	-0.4783 [2.709]	-0.4483 [2.812]	-0.5098 [2.895]	-0.5117 [3.261]	-0.5214 [2.958]	-0.5237 [3.334]	-0.0711 [2.557]	-0.0438 [1.769]
STRIKE/LAYOFF	-1.5262 [3.840]	-1.2436 [3.465]	-1.5013 [3.790]	-1.1904 [3.372]	-1.4849 [3.747]	-1.1712 [3.317]	-0.2937 [4.703]	-0.1638 [2.944]
SELF	0.1031 [0.769]	0.0877 [0.725]	0.0969 [0.726]	0.0753 [0.633]	0.0957 [0.716]	0.0774 [0.650]	0.0128 [0.607]	-0.0062 [0.331]
RETIRED	0.1047 [0.731]	-0.2651 [2.050]	0.0983 [0.689]	-0.2768 [2.176]	0.0997 [0.698]	-0.2716 [2.135]	0.0253 [1.124]	-0.0438 [2.187]
FATHER'S ED	0.0060 [0.517]	0.0018 [0.168]	0.0065 [0.560]	0.0030 [0.2940]	0.0067 [0.576]	0.0039 [0.3815]	0.0004 [0.217]	0.0011 [0.658]
MOTHER'S ED	-0.0270 [1.953]	-0.0190 [1.524]	-0.0252 [1.832]	-0.0162 [1.323]	-0.0258 [1.874]	-0.0170 [1.382]	-0.0046 [2.125]	-0.0027 [1.412]
R ²	0.1375	0.1505	0.1442	0.1787	0.1466	0.1815	0.1459	0.1646

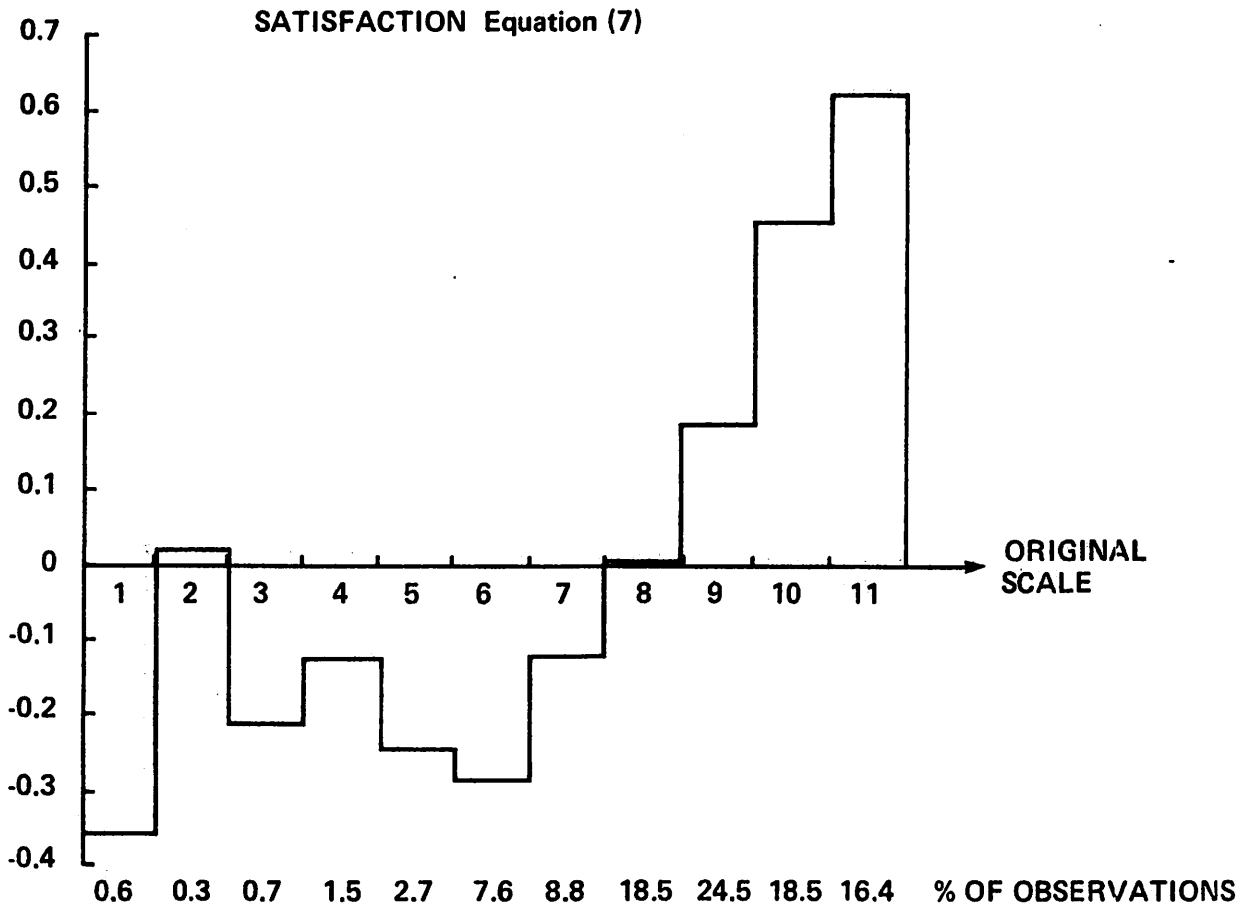
(Table 2 continues next page)

Table 2: (Continued)Notes:

1. N = 3267 all regressions.
2. Absolute values of t-statistics reported in parentheses beneath coefficients.
3. All regressions also included dummy variables for province/region and rural/urban location, missing information on income variables, NUMCHILD, parents education and on constant; coefficients not reported.
4. Regressions (3)-(8) also included a dummy variable for missing information of AVE HAPPINESS.
5. In Regressions (7)-(8) the dependent variables have been rescaled using coefficients computed from canonical correlation regressions. The scaling factors are (low to high, 8 is the reference group) (i) for Satisfaction: -0.3668, 0.0239, -0.2111, -0.1222, -0.2509, -0.2820, -0.1198, +0.1866, +0.4559, +0.6360, (ii) for Happiness: -0.2326, -0.1769, -0.1961, -0.3445, -0.3657, -0.3687, -0.2073, +0.2739, +0.3901, +0.3628.

FIGURE 1 CANONICAL COEFFICIENTS

CANONICAL
SCALE



CANONICAL
SCALE

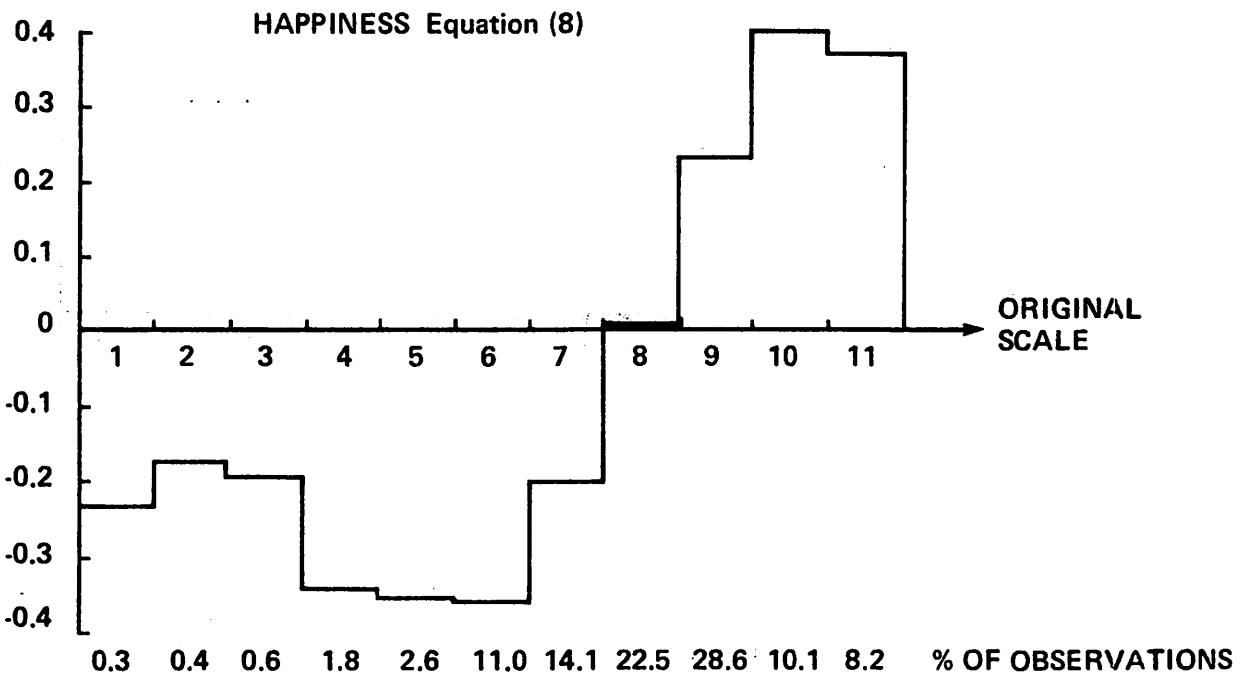


Table 3: Determinants of Happiness and Satisfaction by Sex

Reg No.	MALES		FEMALES	
	(1)	(2)	(3)	(4)
DEPENDENT VAR	SATISFACTION	HAPPINESS	SATISFACTION	HAPPINESS
AVERAGE INCOME	0.0072 [1.227]	0.0141 [2.585]	-0.0076 [1.502]	-0.0074 [1.699]
SHARE POOR	-0.0633 [1.724]	-0.0607 [1.782]	-0.0451 [1.352]	0.0040 [0.137]
SHARE RICH	-0.0039 [0.291]	-0.0058 [0.458]	-0.0071 [0.588]	0.0123 [1.174]
AVE HAPPINESS	0.1385 [4.308]	0.2301 [7.722]	0.0849 [2.961]	0.1840 [7.402]
OWN INCOME	0.0212 [3.775]	0.0199 [3.821]	0.0079 [0.978]	0.0085 [1.218]
OTHER INCOME	0.0099 [2.043]	0.0083 [1.853]	0.0047 [1.063]	0.0119 [3.092]
EDUCATION	-0.0137 [0.746]	-0.0138 [0.811]	0.0134 [0.738]	0.0451 [2.871]
MARRIED	0.3468 [2.237]	0.3042 [2.117]	0.8022 [5.541]	0.4158 [3.313]
DIVORCED/ SEPARATED	0.1026 [0.418]	0.0615 [0.270]	-0.0909 [0.465]	-0.3310 [1.952]
WIDOWED	-0.1425 [0.498]	-0.4537 [1.711]	0.1109 [0.561]	-0.5730 [3.343]
PRESCHOOL	-0.0751 [0.610]	-0.0335 [0.294]	-0.2461 [2.342]	-0.1907 [2.094]
UNEMPL	-0.8638 [3.472]	-0.6732 [2.919]	-0.1882 [0.753]	-0.4020 [1.856]
STRIKE/LAYOFF	-1.3880 [3.134]	-1.4508 [3.534]	-1.7075 [2.106]	-0.3880 [0.552]
MOTHER'S ED	-0.0385 [1.846]	0.0177 [0.917]	-0.0154 [0.838]	-0.0347 [2.172]
R ²	0.1825	0.2166	0.1422	0.1771
N	1333	1333	1934	1934

Notes to Table 3

1. Table reports only the coefficients on selected variables. The regressions included all the variables indicated in Table 2.
2. Absolute value of t-statistics in parentheses beneath coefficients.

Table 4. Probit Regressions

Reg No Dependent Var.*	(1) Happiness > Not Too Happy	(2) Happiness = Very Happy	(3) Happiness > Not Too Happy	(4) Happiness = Very Happy
AVERAGE INCOME	0.0054 [1.147]	-0.0015 [0.521]	0.0052 [1.106]	-0.0014 [0.514]
SHARE POOR	0.0112 [0.314]	-0.0371 [2.057]	0.0103 [0.286]	-0.0363 [2.011]
SHARE RICH	-0.0250 [1.967]	-0.0119 [1.792]	-0.0255 [2.003]	-0.0122 [1.833]
AVE HAPPINESS	-	-	0.0228 [0.759]	0.0238 [1.521]
OWN INCOME	0.0164 [1.929]	0.0049 [1.476]	0.0166 [1.940]	0.0048 [1.458]
OTHER INCOME	0.0117 [1.798]	0.0078 [3.275]	0.0120 [1.835]	0.0080 [3.329]
AGE	-0.0327 [1.860]	-0.0322 [3.767]	-0.0326 [1.850]	-0.0319 [3.732]
AGESQ	.00041 [2.177]	.00040 [4.282]	.00040 [2.170]	.00040 [4.268]
FEMALE	-0.1617 [1.376]	0.0928 [1.689]	-0.1674 [1.422]	0.0909 [1.653]
EDUCATION	0.0045 [0.240]	0.0131 [1.389]	0.0058 [0.306]	0.0137 [1.455]
MARRIED	-0.0559 [0.361]	0.3936 [5.255]	-0.0552 [0.356]	0.3955 [5.279]
DIVORCED/SEPARATED	-0.4738 [2.545]	0.0367 [0.3304]	-0.4744 [2.548]	0.0362 [0.326]
WIDOWED	-0.5863 [2.931]	-0.1724 [1.465]	-0.5793 [2.891]	-0.1741 [1.478]
NUMCHILD	0.0364 [1.312]	-0.0122 [0.875]	0.0368 [1.327]	-0.0116 [0.830]
PRESCHOOL	0.1043 [0.882]	-0.0318 [0.550]	0.1072 [0.905]	-0.0307 [0.531]
HEALTH EXCEL	0.3578 [2.149]	0.4663 [6.737]	0.3484 [2.090]	0.4652 [6.713]
VGOOD	0.2075 [1.754]	0.2958 [5.269]	0.2031 [1.715]	0.2943 [5.239]
FAIR	-0.3229 [2.537]	-0.2489 [3.226]	-0.3277 [2.571]	0.2481 [3.213]
POOR	-0.9737 [4.979]	-0.6384 [3.805]	-0.9817 [5.013]	-0.6483 [3.857]
VSERIOUS	-0.1848 [1.249]	0.1217 [1.169]	-0.1888 [1.277]	0.1221 [1.172]

Table 4 (continued)

Reg No. Dependent Var*	(1) Happiness > Not Too Happy	(2) Happiness = Very Happy	(3) Happiness > Not Too Happy	(4) Happiness = Very Happy
RCATH	-0.0407 [0.331]	-0.0433 [0.745]	0.0390 [0.317]	-0.0452 [0.759]
ROTHER/RNONE	-0.4737 [3.703]	-0.0546 [0.755]	-0.4715 [3.676]	-0.0501 [0.691]
UNEMPLY	-0.1222 [0.534]	-0.2083 [1.596]	-0.1270 [0.554]	-0.2182 [1.669]
STRIKE/LAYOFF	-0.5433 [1.215]	-0.2445 [0.828]	-0.5458 [1.219]	-0.2345 [0.794]
RETIRED	-0.0708 [0.385]	0.1003 [0.952]	-0.0779 [0.423]	0.0993 [0.942]
FATHER'S ED	0.0246 [1.477]	-0.0008 [0.094]	0.0246 [1.471]	-0.0005 [0.0570]
MOTHER'S ED	-0.0132 [0.693]	-0.0097 [0.968]	-0.0125 [0.650]	-0.0097 [0.962]
N OBS	3288	3288	3288	3288
N '0's	131	1627	131	1627
-2 ln λ	180.991	277.580	182.079	280.160

Notes to Table 4:

- * dependent variable coded 1 if criterion satisfied; 0 otherwise.
- Absolute value of asymptotic t statistics reported in parentheses beneath coefficients.
- All regressions included the set of location variables and a constant term.