NOTE ON THE HAPPINESS PARADOX AND THE FALLACY OF REPRESENTATION.

"Measure twice, saw once." B. Franklin.

From source to mouth, the average depth of the Columbia River in Northwest North America is three inches, yet hundreds of people have drowned in this river. How is this possible? How can people drown in a river with an average depth of only three inches? The answer depends on the distribution of people and river depth. If people are concentrated at the river's source where the average depth is only an inch, then the problem is indeed perplexing, suggesting some methodological or omitted variable problem. On the other hand, if people are concentrated at the river's mouth where average depth is a thousand feet, then the problem has an obvious answer. The happiness paradox is another form of the distribution problem. How can average happiness remain virtually unchanged when we know that people with low incomes are much less happier than those with high incomes? The answer depends on the distribution of income.

I. THE HAPPINESS PARADOX

Research into the micro relationship between individual happiness and income has uniformly found high, positive, significant correlations (Frey and Stutzer, 2002, Clark, Frijters and Sheilds, 2008). However, these correlations are not perfect. Even at the highest income levels where most people are "very happy," some are only "pretty happy" while others are "not too happy." Reasons for this lack of happiness remain speculative. Perhaps some people have not yet acquired the fortunes they seek while others are remorseful over the means used to acquire the fortunes they have. Nonetheless,

the relative proportion of those less than very happy is much greater at lower incomes than at higher ones.

Although the micro relationship is clear, research on the macro relationship between average or aggregate happiness and income has uniformly found low, usually insignificant, sometimes wrongly signed correlations (Clark, Frijters and Sheilds, 2008). Thus a conundrum, commonly referenced as the "happiness paradox" (Easterlin, 2001; Frey and Stutzer, 2002) exists: how can the micro correlations be positive and significant when the macro ones are nonexistent and insignificant? Potential explanations abound but it should be noted that exactly the same problem has been encountered in other research involving personal income. The "consumption function paradox" is well-known in macroeconomics, exhaustively studied by Friedman (1957) and many others (see Bunting, 2001), where cross sectional and time series marginal propensities differ. In healthcare, the controversy is over income elasticities where individual elasticities indicate healthcare is a necessity but aggregate ones imply it is a luxury. As Blomqvist and Carter (1997: 208) concede "the discrepancy between income elasticities estimated from individual or family data and those estimated from aggregative cross-sectional or time-series data is not easily explained." Other examples include food expenditures (Fox, 1969: 59; Dovring, 1988:7), electricity (Taylor, 1975) and housing expenditures (Carliner, 1973).

Each situation involves the same set of facts. Some measure of micro behavior is positively and significantly related to income yet when macro averages are calculated the relationship between the measure of behavior and the measure of income changes. In

effect the mechanical process of averaging or aggregating fundamentally changes the relationship among the variables. Technically, alternations or distortions caused by averaging are labeled "aggregation bias." Long ago Theil (1965: 181) concluded "the relation between time series analysis and cross-sectional studies is a difficult subject requiring further analysis" and cited Haavelmo (1947) who thought explanations "seen to run along two different lines, one leading to the conclusion that the problem is 'merely a problem of aggregation,' another to the somewhat negative result that cross-sectional studies 'have no meaning'."

However, the potential consequences of aggregation bias are invariably ignored or unrecognized. Instead, micro and macro differences are attributed to a host of other factors such as omitted variables, defective data, measurement error and econometric complications. Implicit in these explanations is the presupposition that the basic behavioral unit remains unchanged, that is, the consequences of individual and aggregate actions are expected to be identical. By this convention individualistic microeconomic models of household behavior (Friedman, 7ff) are carried forward to analyze macro data with the decision unit now a "representative" one, thought to act as any real person. This belief that macro results reflect individualistic behavior has stimulated nearly endless speculations about its nature and determinants, most recently documented in an extensive survey by Clark, Frijters and Sheilds (2008). However, as will be seen, differences between micro and macro behavior simply arise from different manipulations of the same basic data.

II. MEASURING HAPPINESS

During 26 separate years beginning with 1972 the General Social Survey (Davis, Smith, Marsden, 2007) has asked a sample of Americans 18 and older about their "general happiness (see http://gss.norc.org/)." Respondents are asked "Taken all together, how would you say things are these days - would you say that you are very happy, pretty happy, or not too happy?" The survey also queried about other demographic, sociological and economic characteristics including a question about total family income: "In which of these groups did your total family income, from all sources, fall last year, before taxes, that is?" After eliminating refusals, not applicables, did not knows and similar nonresponses from either question a total of 41,795 of 51,020 responses remained, ranging between 1,223 and 2,627 for the years sampled.

Happiness responses are coded by the GSS as 1 for very happy (vh), 2 for pretty happy (ph) and 3 for not too happy (nth) with coding usually reversed so that larger values and happiness are positively correlated. A basic problem with using code values as response weights is that the values were created for sampling convenience rather than as a measure of the subjective differences among possible responses. As used, the codes imply that the state of very happy is subjectively preferred 3 times more than that of being not too happy. Other weights are obvious.

Income responses are assigned to a specific income group such as $10,000 to $12,499. These were converted into real income levels by averaging the group limits, rounding to thousands and dividing by the appropriate BEA deflator for personal consumption expenditures. Thus, after transformation, the income group above becomes

the income level $11.25 before deflating. The highest group, capturing all incomes above a certain amount, will reflect top-coding. It was converted to an income level by adding to it one half the income range of the immediate preceding group.

Each GSS observation or respondent has three dimensions, survey year, income value and happiness response. Because of unequal numbers at each income level, respondents in each year were sorted by income from low to high and divided into income deciles or quintiles. To facilitate tabular presentation, the 26 separate survey years were compressed into ten three or four adjacent year groups. Finally, each observation was treated as two separate variables, one representing a measure of happiness and the other a measure of income. The happiness measure is defined as h_{tij} and the income measure as y_{tij} where t covers ten yearly groupings beginning with 1972-75, i reflects either quintile or decile position and j can be either a happiness response of very-, pretty- or not too happy or some real income level between $404 and $154,670. For the following discussion, incomes were averaged by quintile or decile to form an income measure y_{ti} while happiness measures were averaged by response type and separated into very happy, vh_{ti}, and not too happy, nth_{ti}.

III. HAPPINESS AND INCOME

The controversy over the happiness paradox can be reduced to considering the implications of two different sorts of the GSS data. Table 1 shows results for various happiness and income measures, controlling for income decile while Table 2 shows results for the same measures controlling for time period. The first table is used to

represent individual or micro behavior and the second to represent average or macro behavior. It should be noted that column totals or averages are identical for both tables.

Table 1, the sort by income decile, shows a clear association between decile happiness measures and average income or income share. From lowest to highest decile, as average income increases almost 19 times and income share increases from around 1 to over 24 percent, the fraction of those very happy more than doubles, from 20.6 to 44.6 percent, while that of those not too happy falls nearly fivefold, from 24.9 to 5.4 percent. Regressions of decile happiness measures on average income add precision to the association. For $vh_i = f(y_i)$, the OLS estimate is $vh_i = 21.68 + 0.2575y_i$ with an adjusted R^2 of .97, both coefficients significant at 1 percent and a happiness-income elasticity of .32. For $nth_i = f(y_i)$, the estimate is $nth_i = 19.53 – 0.1915y_i$ with an R^2 of .73, both coefficients significant at 1 percent and an income elasticity of -.63. Overall, the micro data shows a clear, positive relationship between decile happiness and income.

Table 1

When the GSS data is sorted by time period, the micro relationships previously identified disappear. Although average income and income share increased by about 30 percent from 1972-75 to 2004-06, the percent very happy or not too happy slightly declined from 34.1 to 30.9 percent or from 13.7 to 13.0 percent. Regression estimates confirm the lack of association between measures of average happiness and income. For $vh_t = f(y_t)$, the OLS estimate is $vh_t = 39.42 – 0.1928y_t$ with an adjusted R^2 of .11, neither coefficient significant and an income elasticity of -.24. For $nth_t = f(y_t)$, the estimate is $nth_t = 13.33 – 0.0358y_t$ with an R^2 of 0, neither coefficient significant and an income

elasticity of -.12. Clearly, the macro data indicate no significant, positive relationship between average happiness and income.

Table 2

Statistical differences between the two GSS sorts are obvious in that the paradoxical happiness-income relationship seems to be a product of data manipulation. From the decile sort the marginal propensity of .26 for very happy and -.19 for not too happy were both expected and significant. The income elasticities indicate income changes have a less than proportionate influence on happiness. The coefficients of determination suggest the estimated relationships are meaningful. On the other hand, the time based sorts indicate no significant association—both marginal propensities are insignificant, the happiness one in incorrectly signed and the coefficients of determination are effectively zero.

Results such as these are well-know and have sparked proposals for reformulation of economics on revised principles, usually based on psychological speculations about relative economic behavior. For a sampling of the literature see the references cited herein as well as Wikipedia (2008), Stevenson and Wolfers (2008), a historical survey by Smith (1979), and an interesting survey review by Diener and Biswas-Diener (2002). Easterlin (1972, summarized in 2001) and later Myers (2000) for a general, non-economics audience, compared the trend of average happiness with annual estimates of real average family income derived from the Current Population Survey (2008) which has increased by more than 50 percent since 1972. Repeating conventional theoretical notions regarding utility seeking behavior and well as commonplace beliefs that utility, measured

by happiness, and income should be positively related according to the rule that "more is better," they identified a fundamental change in traditional human behavior. Apparently additional income beyond some minimum threshold, generally a rising standard of living, does not seem to increase general welfare, however measured. As succinctly summarized by Layard (2006: 31), "This is the paradox. When people become richer compared to other people, they become happier. But when whole societies have become richer, they have not become happier."

IV. DISTRIBUTIONAL INFLUENCES

The insignificant, sometimes wrong signed correlation of changes in average happiness and average income is an artifact produced by the measurement of happiness and the distribution of income. Suppose there are two people, one poor with an income of 4 and another rich with an income of 12. Being poor, the poor person is not too happy while the rich person, as expected, is very happy. Using the coding previous described, average happiness is 2 and average income is 8. Suppose the income of the rich person doubles. The poor person has no reason to become more happier while the rich person cannot be more than very happy. Thus average happiness remains unchanged while average income rises to 14. Suppose the income of the poor person falls. Average income will decline but average happiness will remain unchanged because the poor person cannot be less than not too happy while the rich person has no reason change its happiness.

Basically, there is a fundamental inconsistency in the dimensions of happiness and income. While happiness responses are finite, ranging from 1 to 3 in the GSS survey and from 1 to 10 or 20 in other surveys, income responses are infinite, ranging from $404

to $154,670 in the GSS survey and limited only by topcoding in other surveys. Since finite responses are compared to infinite responses, it is possible that income increases can produce no change in the overall fraction of those very happy. As another example, suppose 3 or 30 percent of 10 respondents are very happy. Suppose their income increases while the incomes of the other 7 remains unchanged. Since people cannot be more than very happy, their responses will not change while the others have no reason to alter their responses. Thus, the macro data will show no correlation between income changes and happiness changes.

As with the river analogy, the relationship between happiness and income depends on distribution. Table 3 shows the distribution of percent very happy by income quintile (rather than decile so as to facilitate tabular presentation) and time period while Table 4 shows the distribution of average income by the same controlling parameters. Both tables show distinct differences quintile by quintile. As indicated in Table 1, first quintile (Q1) income and happiness averages are ten times and half, respectively, less than those for Q5. Differences between average quintile happiness and average yearly happiness are simply explained by their calculation. Average happiness for some quintile i is found by $\sum ah_{ti}$, t = 1 to n years, while average happiness for some year t is found by $\sum vh_{ti}$, i = 1 to m quintiles. Since dimensions differ, yearly row and column averages are not comparable. When the association between average happiness and income is estimated for all quintiles and time periods, $vh_{ti} = f(y_{ti})$, the happiness paradox disappears. The OLS estimate for all 50 observations in the tables is $vh_{ti} = 21.94 + 0.2518y_{ti}$ with an R^2 of .84, both coefficients significant at 1 percent and an income

elasticity of .31. Similar results are found for $nth_{ti} = f(y_{ti})$, where $nth_{ti} = 19.47 - 0.1921y_{ti}$ with an R^2 of .74, both coefficients significant at 1 percent and an income elasticity of -.63. Both the estimates indicate that measures of happiness are significantly related to income as predicted by conventional theories of utility maximizing behavior.

Table 3

Table 4

The basic premise of the happiness paradox is that changes in average income have not produced changes in average happiness. As indicated, average happiness is found by averaging across all respondents in any row. However, average happiness can also be found by first estimating the relationship between quintile happiness and income, estimating average happiness, and then averaged for all quintiles in some time period. Using the figures found in Tables 3 and 4, estimates of average happiness, $ah_{ti} = f(y_{ti})$, t = 1, n years, for each quintile are :

$$Q1: ah_{1t} = 22.08 + 0.0606y_{1t}$$

$$Q2: ah_{2t} = 49.72 - 1.1054y_{2t}$$

$$Q3: ah_{3t} = 32.50 - 0.0420y_{3t}$$

$$Q4: ah_{4t} = 37.91 - 0.0428y_{4t}$$

$$Q5: ah_{5t} = 36.08 + 0.0774y_{5t}$$

With the exception of the fifth quintile, slight variations in income causes fits to be poor and marginal propensities to be either wrong signed or insignificant. Nonetheless, these estimates can be used to estimate average happiness in any year using quintile incomes found in Table 4, e.g., for year t and all five quintiles, $AH_t = (\Sigma a_i + \Sigma b_i y_{ti})/5$. Table 5

compares calculated and estimated average percent very happy. The estimates range between 1.8 and 7.7 percent of the calculated percents with an average error of 4.2 percent. They clearly indicate that average percent very happy is determined by average quintile, rather than overall, income. In effect, when considering the relationship between happiness and income, average income is irrelevant.

There are some other problems with the analytical basis of the happiness paradox. First, GSS and CPS survey results are not comparable. Since 1972, average income in the GSS survey increased about 30 percent while the CPS average increased 50 percent. Hence expected changes in happiness should be sharply reduced to be consistent with the income of respondents indicating their views on happiness. Second, only since 1996-98 has GSS average income or income in the lowest four quintiles significantly increased. Hence, for much of the period covered by the survey there has been little reason for respondents to become more happier.

Third, column or row averages in any table are weighted averages. As the Gini coefficients indicate, there has been little change in the relative magnitudes of the components of these averages. Indirectly, the stable Gini income coefficients are consistent with the happiness paradox, that is, since the distribution of income has not shown much variation, the level of average happiness has remained virtually unchanged. Finally, consistent with nearly every study of U.S. income distribution, only the fifth quintile has shown much income growth over the past thirty years (U.S. Census Bureau, 2008). But this growth is not sufficient to change the level of average happiness. Suppose happiness for Q5 recipients is directly proportional to their income. If the percent very

happy increased with income growth, then by 2004-06 60.8 percent of Q5 respondents would indicate that they were very happy as opposed to the current 43.9 percent. Yet this increase must be averaged with the responses of the other four quintiles. Overall, average happiness would increase only by four percentage points, making the 2004-06 average only one tenth of a percentage point larger than the 1972-75 average, 34.2 as compared to 34.1.

Like the consumption function paradox or the conflict between different health care income elasticities, the happiness paradox is fundamentally a misperception, arising first by assuming that average behavior replicates individual behavior. Implicit in this fallacy of representation is that all behavioral units, individual or aggregate, are identical. Second, distributional effects are ignored. Responses based on time considerations are treated separately from those based on group considerations. When this artificial distinction is removed and all data utilized, individual and average conflicts vanish.

V. SPURIOUS CORRELATIONS

As indicated, the failure of average happiness to positively correlate with average income has struck many observers as paradoxical. After all, economic development as manifested in a rising standard of living is conventionally thought to increase both welfare and happiness. However, in the long run, happiness and income only can be spuriously correlated. Suppose the percent very happy is positively correlated with family income growth, increasing 1 percent annually as income increases at a slightly higher rate. Starting with the current percent very happy of 30 percent, this implies that in about 120 year, e.g., $100 = 30(1.01)^t$, roughly in the year 2129, everyone in the country will be

very happy and no one will be pretty happy or not too happy. Thereafter, however, the correlation of happiness and family income must fall to zero because while income can continue to grow without limit, no more than 100 percent of the respondents can be very happy. Thus, in the long run, the relationship between happiness and income must always be "paradoxical" with income growing and happiness measures remaining unchanged.

Similarly, the overall regression of the percent very happy and income found a positive, significant marginal propensity. When solving this estimating equation for 100 percent very happy, when average income reaches $310,000, an admittedly out of range figure, perfect happiness will prevail. While this might seem absurd, a positive relationship between happiness and income nonetheless predicts a future of tranquility.

Finally, the failure of average happiness to be positively correlated with average income is not unique. As Table 6 shows, a number of other GSS indicators of social well being are also negatively correlated. As average income increases, the fraction of respondents with very happy marriages declines as does those in excellent health or those who believe people try to be fair or that people are helpful. On the other hand, as predicted by conventional utility maximizing theories, people believe that as their income increases, they have a better financial situation and are satisfied with their financial situation but are less satisfied with their job. All these correlations invite elaborate interpretation and explanation. Alternatively, and perhaps more usefully, the responses should be compared against the income shares of the respondents and their relative position in the economy.

Table 6

VI. CONCLUSIONS

Conflicting, actually unexpected, results are a common occurrence in empirical economics. However, designating these results as "paradoxical" requires careful checking and replication. While the use of representative behavior is also common in economics, the assignment of averages for all respondents to individuals or groups is inappropriate. Long ago Keynes identified this practice in his discussion of individual and aggregate saving behavior as fallacious. Outside the community of economics, conflicts between individual and average results are well known and well understood as Simpson's Paradox or ecological fallacies. Both these concepts deal with the dangers "in thinking that relationships observed for groups necessarily hold for individuals (Freedman, 2000)."

While study of the determinants of happiness is one of the nobler activities in the economics profession, a significant fraction of this study has been diverted in the attempt to resolve a fallacious paradox. Rather than explained by omitted variables, defective data, measurement errors or econometric considerations, differences between micro and macro estimates of the relationship between happiness and income are caused by distributional differences in the data used to calculate the estimates. When preconceptions of representative behavior are abandoned and the differential effects of distribution are acknowledged, different micro and macro behavior is not only reasonable but should be expected.

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TABLES

Table 1. Percent Happiness by Decile

	Frequency			Shares		Income	
Decile	vh_i	nth_i	n_i	vh_i	nth_i	Ave.	Share
1	857	1,036	4,166	20.6	24.9	5.04	1.28
2	1,027	782	4,178	24.6	18.7	11.41	2.91
3	1,101	654	4,180	26.3	15.6	17.34	4.42
4	1,175	571	4,181	28.1	13.7	23.62	6.02
5	1,257	440	4,175	30.1	10.5	30.34	7.72
6	1,339	410	4,181	32.0	9.8	37.26	9.49
7	1,455	353	4,182	34.8	8.4	44.90	11.44
8	1,526	312	4,179	36.5	7.5	55.57	14.15
9	1,680	235	4,179	40.2	5.6	71.64	18.25
10	1,872	228	4,194	44.6	5.4	95.14	24.32
Tot/Ave	13,289	5,021	41,795	31.8	12.0	39.26	100.00

Table 2. Percent Happiness by Year.

	Frequency			Shares		Income	
Years	vh_t	nth_t	n_t	vh_t	nth_t	Ave.	Share
1972-75	1,913	771	5,618	34.1	13.7	36.15	9.21
1976-78	1,459	459	4,210	34.7	10.9	37.25	9.49
1980-82	951	422	3,030	31.4	13.9	35.02	8.92
1983-85	1,308	515	4,165	31.4	12.4	36.76	9.36
1986-88	1,362	485	4,312	31.6	11.2	37.01	9.43
1989-90	868	243	2,594	33.5	9.4	38.40	9.78
1991-94	1,614	629	5,448	29.6	11.5	39.18	9.98
1996-98	1,534	606	5,025	30.5	12.1	41.99	10.70
2000-02	1,123	404	3,644	30.8	11.1	44.32	11.29
2004-06	1,157	487	3,749	30.9	13.0	47.07	11.99
Tot/Ave	13,289	5,021	41,795	31.8	12.0	39.26	100.00

Table 3. Distribution of Percent Very Happy (%).

Years	Q1	Q2	Q3	Q4	Q5	Ave.	Gini
1972-75	26.4	31.2	33.2	38.0	41.5	34.1	.087
1976-78	26.1	32.5	31.4	39.2	44.0	34.7	.099
1980-82	22.8	29.0	28.4	33.5	43.2	31.4	.116
1983-85	23.9	27.1	31.2	33.4	41.4	31.4	.106
1986-88	21.6	27.3	31.1	35.3	42.7	31.6	.128
1989-90	23.6	27.6	35.1	39.3	41.7	33.5	.116
1991-94	17.5	26.5	29.7	34.2	40.2	29.6	.144
1996-98	23.3	22.8	31.4	32.8	42.2	30.5	.126
2000-02	19.0	24.8	33.0	32.6	44.7	30.8	.154
2004-06	21.8	22.9	26.4	39.2	43.9	30.9	.158
Ave.	22.6	27.2	31.1	35.7	42.4	31.8	.122

Table 4. Distribution of Average Income ($000).

Years	Q1	Q2	Q3	Q4	Q5	Ave.	Gini
1972-75	8.25	20.93	34.47	45.01	71.97	36.15	.335
1976-78	8.59	19.77	31.63	44.70	81.43	37.25	.366
1980-82	7.03	17.37	28.67	45.44	76.46	35.02	.381
1983-85	7.81	19.14	31.86	47.37	77.36	36.76	.363
1986-88	7.30	18.60	32.36	48.63	78.05	37.01	.370
1989-90	8.74	20.52	33.79	50.88	77.91	38.40	.351
1991-94	8.23	20.56	33.74	51.26	82.02	39.18	.363
1996-98	8.83	22.35	35.46	54.01	89.21	41.99	.366
2000-02	8.74	21.86	36.31	56.85	97.73	44.32	.384
2004-06	8.64	22.78	38.66	59.71	105.43	47.07	.391
Ave.	8.23	20.48	33.80	50.23	83.41	39.26	.366

Table 5. Calculated and Estimated
Average Percent Very Happy

	Ave. % Very Happy			
Years	Calculated	Estimated	Error	% Error
1972-75	34.1	31.6	2.48	7.3
1976-78	34.7	32.0	2.65	7.7
1980-82	31.4	32.5	-1.07	3.4
1983-85	31.4	32.0	-0.64	2.0
1986-88	31.6	32.2	-0.57	1.8
1989-90	33.5	31.7	1.75	5.2
1991-94	29.6	31.8	-2.13	7.2
1996-98	30.5	31.4	-0.92	3.0
2000-02	30.8	31.7	-0.83	2.7
2004-06	30.9	31.5	-0.66	2.1

Table 6. GSS Social Indicator Correlation with Average Income

Social Indicator	Correlation with Income	Percent Agreement
Very Happy	-.2406	32.2
Very Happy Marriage	-.3981	63.6
Excellent Health	-.4349	31.3
Can Trust People	-.6460	39.0
People are Helpful	-.3033	49.6
People Try to be Fair	-.8250	56.9
Family Income Average	-.6112	51.0
Very Satisfied with Job	-.0038	47.7
Better Financial Situation	.3881	38.7
Satisfied with Financial Situation	.1729	29.8