REVISITING THE EASTERLIN PARADOX: WHAT CAN WE LEARN FROM IT?

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Abstract
This paper examines the Easterlin paradox using empirical and simulated data. The results reveal that the existence of Easterlin paradox could be just due to the rating scale of happiness measurement. The rating scale measurement of self-reported happiness limits the variation of happiness of time series data due to the averaging effect compared to the happiness variation of cross-sectional data. Mathematically, the low variation of happiness can lead to the Easterlin paradox: cross-sectional effects of income on happiness are significant but turn into insignificant for time series happiness. The result of simulated data without the scale of happiness measurement, i.e., the underlying happiness, shows that the effects of income on happiness are significant at cross-sectional and time series data. Nevertheless, once the limited scale of happiness measurement, i.e., the self-reported happiness, is used, the income effect is significant only at cross-sectional data. Thus, the low variation in scale of measurement can be the cause of the Easterlin paradox. What we can learn is: the limited scale of happiness measurement produces the Easterlin paradox, and the happiness measurement needs to be revised to ensure the variation in happiness could be captured adequately.

Keywords: *Easterlin paradox, happiness measurement scale, variation of happiness measurement.*
JEL Codes: *D630; I310; O000.*

Introduction

During the last two decades, economic studies on happiness have grown rapidly, particularly studies on the Easterlin paradox (also known as Income-Happiness Paradox). The Easterlin paradox refers to a contradictory finding on income-happiness relationship using time series and cross-sectional data: at one point of time (cross section), there is a significant positive relationship between income and happiness; over time (time series), this relationship is insignificant.

Using the US data, Easterlin (1974) showed that over time the time trend of US happiness is a "flat curve", despite the significant increase in income. This time series "flat curve" of happiness is also found in countries such as Japan, UK, France, Germany, Italy, and the Netherlands (Clark, Frijters, & Shields, 2007). Recently, Easterlin et al. (2011) provided further evidence on this paradox in more than 30 countries across different continents.

There are two important implications of this paradox. Firstly, it implies that the classical economics analysis of utility (which links utility to consumption of goods and income) is less relevant. Secondly, it indicates the need to re-balance the focus of a government's policy between income (GDP growth) and non-income factors. Thus, this paradox draws significant implications for economic studies. It is not a surprise at all to see many studies have been devoted to examining this paradox.

In general, two approaches explain this paradox – "omitted variables" and "social comparison" (Di Tella & MacCulloch, 2005; Easterlin, 1995, 2001; Pugno, 2011; Clark, Frijters, & Shields, 2007; Tian & Yang, 2010). Tian and Yang (2010) developed a formal economic theory and found that this paradox exists due to non-income factors ("omitted variables" explanations) and income buys little happiness after a critical level of income (social comparison approach). On the other hand, other studies found that income buys happiness (for instance, see Deaton, 2008; Inglehard, Foa, Peterson, & Wetzel, 2008; Stevenson & Wolfers, 2008).

Nevertheless, one of the important aspects that have been largely ignored is: Easterlin paradox may exist just due to statistical measurement on the reported happiness (averaging and measurement scale). Individual happiness is measured with a rating scale, for example, a four-point rating scale, and the happiness distribution is well known with its skewed distribution, which implies that there are limited variations in individual happiness. To obtain a value of happiness at one point in time, we average the individual happiness. By conventional wisdom, the average values of happiness would not have substantial variations over time.

Consequently, we might observe a "flat" time series happiness curve while, at one point in time, happiness is significantly correlated with income across different individuals. Statistically, it has been shown that an independent variable (income) is positively related to a dependent variable (happiness) due to the variations in the dependent variable, i.e., variation in happiness (see Gujarati, 2004, p. 62). Thus, averaging and a limited measurement scale create the Easterlin Paradox. To fill the gap, the present paper revisits the Easterlin paradox and estimates the influences of averaging and measurement scale on the paradox by using empirical and simulated data.

Data

The widely used happiness data were obtained from the World Value Survey. The happiness measurement was self-reported on a four-point Likert scale (1=very happy; 2=quite happy; 3= not very happy; 4=not all happy).

To compare the effects of income on self-reported and underlying happiness, a set of panel data (happiness and income) was simulated using the following assumptions:

- Three individuals (ID = 1, 2 and 3) over 13 years (2006 to 2018)
- Two common shocks occur at 2006 and 2018 over the period from 2006 to 2018. These shocks reduce 20% of individual income. These income shocks reflect the financial crisis that occurs historically.
- Income growth at a compound rate of 5% per annual.
- Initial incomes (2006) are at a level of 10, 12 and 15 for individual 1, 2, and 3 respectively.
- Underlying happiness is related to income significantly: $Underlying\ happiness = 0.8Income + e \quad where\ e{\sim}N(0,1)$.
- The self-reported happiness is measured at a five-point rating scale which links to underlying happiness with a skewed distribution: Scale 1 (very unhappy, 5%), 2 (26%), 3 (28%), 4 (36%), 5 (very happy, 5%). In the literature, the distribution of reported

happiness is found to be skewed to the right (see Cummins, 2003; Lim, 2008). The happiness distribution is shown in Figure 1.

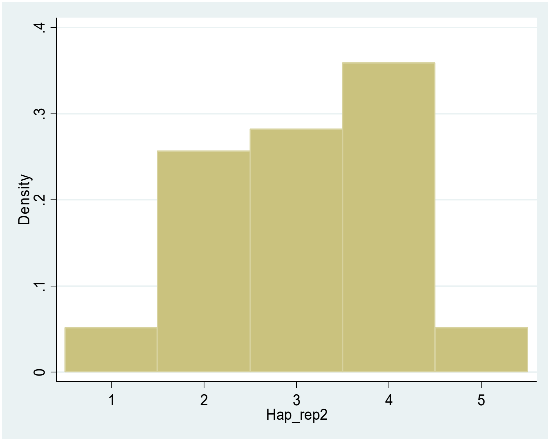

Figure 1. Skewness of distribution of reported happiness

The simulation data are presented in Appendix A.

Analysis and Results

The effects of averaging can be illustrated by using the following mathematical manipulations. Given a happiness regression model of a cross-sectional data:

$$H_i = a + bINC_i + e_i \qquad i = 1,2,\dots,n \tag{1}$$

where
H = happiness
INC = income
e = error term

The slope, b, measures the effect of income (INC) on happiness (H). Taking variance on both sides of equation (1) and with some algebra manipulation (see Appendix B), we obtain:

$$var(H_i) = b^2 var(INC_i) + var(e_i) + 2b\,(cov(INC_i, e_i)) \tag{2}$$

By the assumption of Classical Linear Assumption Model (CRLM), the $var(e_i) = \sigma^2$ and $cov(INC_i, e_i) = 0$:

$$var(H_i) = b^2 var(INC_i) + \sigma^2 + 2b\,(0)$$
$$var(H_i) = b^2 var(INC_i) + \sigma^2$$
$$b^2 var(INC_i) = var(H_i) - \sigma^2$$

Thus, we obtain Equation (3) below:

$$b^2 = \frac{var(H_i)}{var(INC_i)} - \frac{\sigma^2}{var(INC_i)} \tag{3}$$

Taking a square root on both sides of Equation (3), we obtain:

$$\sqrt{b^2} = \sqrt{\frac{var(H_i)}{var(INC_i)}} - \sqrt{\frac{\sigma^2}{var(INC_i)}}$$

Apply the quotient rule for radicals,

$$\sqrt{b^2} = \frac{\sqrt{var(H_i)}}{\sqrt{var(INC_i)}} - \frac{\sqrt{\sigma^2}}{\sqrt{var(INC_i)}}$$

Since the square root of a variance is a standard deviation, we obtain Equation (4)

$$b = \frac{std(H_i)}{std(INC_i)} - \frac{\sigma}{std(INC_i)} \qquad where\ std = standard\ deviation \qquad (4)$$

Equation (4) can be expressed in terms of time series data as in Equation (5) below:

$$b = \frac{std(H_t)}{std(INC_t)} - \frac{\sigma}{std(INC_t)} \qquad (5)$$

Equation (4) and (5), *ceteris paribus*, clearly show that the effects of income on happiness (*b*) is positively related to the standard deviation of happiness. Thus, if the variance of happiness reduces, then the effect of income on happiness decreases.

To obtain the time series happiness measurement for a country, we need to average the individual self-reported happiness in the country at each point of time, i.e., averaging the cross-sectional happiness data. This averaging of individual's self-reported happiness will reduce the variance in happiness. For example, the extreme values of cross-sectional individual happiness will be averaged down or up to the mean value, i.e., the time series value of happiness. As such, the variances of happiness of cross-sectional data tends to be higher than the variance of happiness of time series data. By Equation (4) and (5), this implies that:

$$b^{Cross-setiona} > b^{Time\ series} \qquad (6)$$

Thus, we are likely to observe that the effect of income on happiness is significant using cross-sectional data and insignificant using time series data due to the averaging, i.e., the occurrence of Easterlin Paradox. Empirically, by using the happiness data of the World Value Survey, the effects of income on happiness are estimated by the time series and cross-sectional data. Table 1 presents the results. Table 1 shows that the Easterlin Paradox exists – the cross-sectional effect of income is found to be significant while the time series effect of income is insignificant.

Table 1. Cross-sectional and time-series effects of income on happiness (empirical data)

	Estimated slope (effect of income to happiness, *b*)								
	Chile	China	India	Japan	S Korea	Mexico	S Africa	Spain	Turkey
Cross sectional:									
Wave 81-84	-	-	-	-0.009	-0.110*	-0.023*	-0.062*		
Wave 89-93	-0.063*	0.053*	-0.043*	-0.036*	-0.015*	-0.068*	-0.135*	-0.031*	-0.070*
Wave 94-99	-0.058*	-0.104*	-0.022**	-0.0403*	-0.015*	-0.062*	0.082*	-0.034*	0.001*
Wave 99-04	-0.033*	-0.069*	-0.057*	-0.0160*	-0.015*	-0.032*	0.044*	-0.039*	-0.042*
Wave 05-07	-0.081*	-0.117*	-0.065*	-0.0298*	-0.066*	-0.035*	-0.099*	-0.054*	0.017*
Time series:									
1982-2007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: * and ** represent 1% and 5% significance level respectively.
Source: World value survey http://www.worldvaluessurvey.org/WVSContents.jsp

To gain further insights, the simulated data are used to estimate the cross-sectional and time series effects of income on happiness. Table 2 presents the results. Table 2 indicates that in Model TS1 (time series) and Model CS1-CS13 (cross-sectional), the effect of income on happiness (the estimated slope) is estimated at around 0.14 (significant) and 0.04 (insignificant) respectively. Hence, the Easterlin Paradox exists in the simulated data. This finding is obtained using self-reported happiness on a five-point rating scale.

Table 2. Cross-sectional and time-series effects of income on happiness (simulated data, reported happiness)

	Effect of income to reported happiness (slope, *b*)
Cross-sectional:	
CS1 (2006)	0.1429*
CS2 (2007)	0.1361*
CS3 (2008)	0.1425*
CS4 (2009)	0.1524*
CS5 (2010)	0.1452*
CS6 (2011)	0.1314*
CS7 (2012)	0.1317*
CS8 (2013)	0.1191*
CS9 (2014)	0.1475*
CS10 (2015)	0.1405*
CS11 (2016)	0.1338*
CS12 (2017)	0.1657*
CS13 (2018)	0.1517*
Time series:	
TS1 (2006-2018)	0.0439

Note: * represents 1% significant level.

If we use the underlying happiness instead of the self-reported happiness, the Easterlin Paradox disappears. Table 3 presents the estimated results. The estimated effects of income on happiness are found to be around 0.80 and 0.54 for cross-sectional and time series models respectively (see Table 3). It is important to note that in the simulated data, the difference between the underlying and self-reported happiness is that the self-reported happiness has categorised the underlying happiness (ratio scale) into five rating groups (five-point rating scale). The variance of underlying happiness is higher than that of the self-reported happiness. The increases in the variance of happiness vanish the Easterlin Paradox.

Table 3. Cross-sectional and time-series effects of income on happiness (simulated data, unobserved happiness)

	Effect of income to unobserved happiness (slope, *b*)
Cross-sectional:	
CS1 (2006)	0.8219*
CS2 (2007)	0.8471*
CS3 (2008)	0.7889*
CS4 (2009)	0.8334*
CS5 (2010)	0.8113*
CS6 (2011)	0.8053*

CS7 (2012)	0.7724*
CS8 (2013)	0.7728*
CS9 (2014)	0.8178*
CS10 (2015)	0.8041*
CS11 (2016)	0.8190*
CS12 (2017)	0.8169*
CS13 (2018)	0.7857*
Time series:	
TS1 (2006-2018)	0.5371*

Note: * represents 1% significant level.

Discussions and Conclusion

This paper revisited the Easterlin paradox using empirical and simulated data. The results show that the averaging and limited scale of happiness measurement is a potential explanation for the existence of Easterlin paradox. Averaging is a necessary statistical procedure to calculate the self-reported time series happiness. Happiness is usually measured by a single item measurement with a four-point to 11-point rating scale, one end being "very unhappy" and the other end being "very happy" (Lim, 2007). This one-item measurement can lead to a low variation in happiness measurement. The literature has found that, empirically, the distribution of reported happiness is skewed to the right. Individuals tend to choose only the points at the right-hand side.

For example, individuals tend to choose a point of 5 or 6 or 7 in a seven-point rating scale. As a result, a low variation in the happiness measurement occurs. The one-item measurement limits the variations of reported happiness. The variance of reported happiness is lower than the underlying happiness. Consequently, it turns the significant effect of income into insignificant. The time-series happiness is obtained by averaging the cross-sectional individual happiness, which further reduces the happiness variation in time series data and produces the Easterlin paradox.

It is suggested that happiness should be measured with a new scale that allows a wider range of happiness, for example, a two-stage measurement of happiness that is similar to the concept of Heckman two-stage selection (see Heckman, 1979). In the first stage, we use a dichotomous measurement of happiness. The respondents are asked to report whether they are happy or not with their life. In the second stage, we use a rating measurement of happiness. For respondents who are reported happy (or unhappy) in the first stage, they are asked to rate to what extent they are happy (or unhappy) on a seven-point rating scale. Then, combining the two-stage measurement of happiness, we obtain a happiness measurement scale which ranges from -7 to +7. Thus, we obtain more variations in our happiness measurement and reduce the averaging effect. Future research is suggested to explore this contention.

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Appendix A: Simulated Data

ID	Year	Income	Hap_util	C_shock	Hap_rep2	error	Year1	Inc_m	Hap_u_m	Hap_r2_m
1	2006	10.000	9.545	0	2	1.545	2006	20.000	16.857	3.000
1	2007	10.500	8.671	0	2	0.271	2007	21.000	17.712	3.000
1	2008	11.025	9.185	0	2	0.365	2008	22.050	17.676	3.333
1	2009	9.371	8.308	-0.2	2	0.811	2009	18.743	15.660	3.000
1	2010	9.840	9.538	0	2	1.666	2010	19.680	16.341	3.000
1	2011	10.332	6.165	0	1	-2.100	2011	20.664	16.275	2.667
1	2012	10.848	8.843	0	2	0.164	2012	21.697	16.926	3.000
1	2013	11.391	7.154	0	1	-1.958	2013	22.782	17.228	2.667
1	2014	9.682	8.714	-0.2	2	0.969	2014	19.364	15.952	3.000
1	2015	10.166	9.222	0	2	1.089	2015	20.333	16.562	3.000
1	2016	10.675	9.613	0	2	1.073	2016	21.349	17.627	3.000
1	2017	11.208	9.794	0	3	0.827	2017	22.417	18.478	4.000
1	2018	11.769	8.529	0	2	-0.886	2018	23.538	18.357	3.667
2	2006	20.000	17.559	0	3	1.559				
2	2007	21.000	17.538	0	3	0.738				
2	2008	22.050	18.937	0	4	1.297				
2	2009	18.743	14.980	-0.2	3	-0.014				
2	2010	19.680	16.238	0	3	0.494				
2	2011	20.664	17.667	0	3	1.136				
2	2012	21.697	17.332	0	3	-0.026				
2	2013	22.782	17.501	0	3	-0.724				
2	2014	19.364	15.290	-0.2	3	-0.201				
2	2015	20.333	16.166	0	3	-0.100				
2	2016	21.349	17.024	0	3	-0.056				
2	2017	22.417	18.530	0	4	0.597				
2	2018	23.538	18.700	0	4	-0.130				
3	2006	30.000	23.467	0	4	-0.533				
3	2007	31.500	26.926	0	4	1.726				
3	2008	33.075	24.905	0	4	-1.555				
3	2009	28.114	23.691	-0.2	4	1.200				
3	2010	29.519	23.248	0	4	-0.368				
3	2011	30.995	24.994	0	4	0.197				
3	2012	32.545	24.603	0	4	-1.433				
3	2013	34.172	27.029	0	4	-0.309				
3	2014	29.047	23.851	-0.2	4	0.613				
3	2015	30.499	24.297	0	4	-0.102				
3	2016	32.024	26.244	0	4	0.625				
3	2017	33.625	27.108	0	5	0.208				
3	2018	35.306	27.843	0	5	-0.402				

Note: Hap_util = underlying happiness; C_shock = common macro-economic shocks to income; Hap_rep2 = self-reported happiness at 5-point scale which skewness (to the right) distributed based on the Hap_util; error = error terms which are standard normally distributed; Inc_m = average of income on a particular year; Hap_u_m=average of underlying happiness; Hap_r2_m=average of Hap_rep2.

Appendix B: Derivation of Equation (2)

Taking variance on the both side of the Equation (1), $H_i = a + bINC_i + e_i$, we obtain,

$$var(H_i) = var(a + bINC_i + e_i)$$

With further algebra manipulation,

$$var(H_i) = var(a) + var(bINC_i) + var(e_i) + 2cov(bINC_i,\ e_i)$$
$$var(H_i) = 0 + b^2 var(INC_i) + var(e_i) + 2cov(bINC_i,\ e_i)$$
$$var(H_i) = b^2 var(INC_i) + var(e_i) + 2E((bINC_i)(\ e_i) - E(bINC_i)E(\ e_i))$$
$$var(H_i) = b^2 var(INC_i) + var(e_i) + 2bE((INC_i)(\ e_i) - bE(INC_i)E(\ e_i))$$
$$var(H_i) = b^2 var(INC_i) + var(e_i) + 2b\ (cov(INC_i, e_i))$$

Thus, we obtain the Equation (2) as below:

$$var(H_i) = b^2 var(INC_i) + var(e_i) + 2b\ (cov(INC_i, e_i)) \quad (2)$$