Is Happiness Good for Economic Growth?*

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Abstract

This paper examines the impact of happiness of residents on economic growth across countries. We first document a robust positive correlation between happiness level and economic growth across countries, and then use sex imbalance, which impedes normal mating and thus causes unhappiness, to instrument happiness and identify its causal impact on economic growth. Our results show that happiness has a positive causal effect on economic growth. In addition, we find life expectancy and investment ratio to be two likely channels through which happiness works.

Keywords: Happiness, Economic Growth, Sex Imbalance, Life expectancy, Investment Ratio.

JEL codes: O50, I30.

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1 Introduction

> The good life, as I conceive it, is a happy life. I do not mean that if you are good you will be happy; I mean that if you are happy you will be good.
>
> –Bertrand Russell

Happiness matters much for the life of an individual, just as Russell said.[1] It remains unknown whether the happiness of residents have impacts on the economic growth of a given country. **Figure 1** displays a positive correlation between happiness level of residents and growth rate of gross domestic product (GDP) per capita across countries in the 1990s. For example, Denmark (DNK) with a happiness level of 8.20 experienced an annual growth rate of 2.02%, while Moldova (MDA) with a happiness level of 4.15 had an annual growth rate of -3.84%.

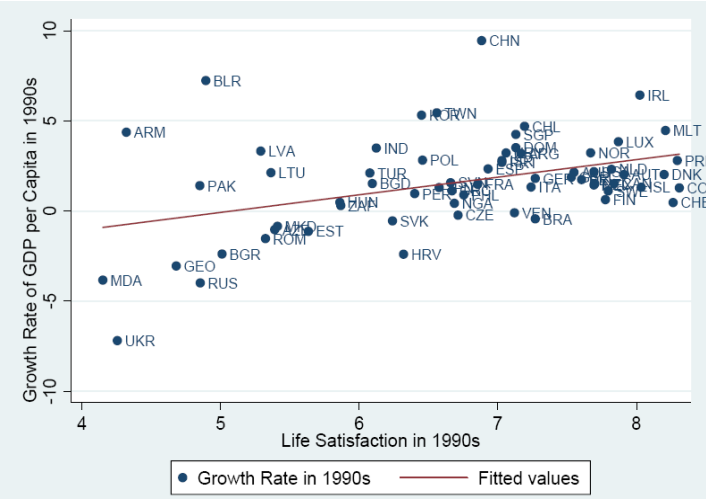

Figure 1: Happiness and Economic Growth

This correlation can be explained by factors that correlate with both economic growth

[1] See Oswald, Proto, and Sgroi (2008) for econometric evidence.

and happiness, or the fact that economic growth fosters happiness.[2] To isolate the effect of happiness on economic growth, we then exploit the variation in sex imbalance as a source of the variation in happiness. Sex ratios that deviate from the balanced level cause difficulty in mating and thus depress the happiness of populace, because partnership, including marriage and cohabitation, and sexual activities are important sources of happiness (e.g., Blanchflower and Oswald, 2004). Defining sex imbalance as $(1 - M/F)^2$, where M and F are respectively male and female population, **Figure 2** exhibits a strong negative correlation between sex imbalance and happiness across countries.

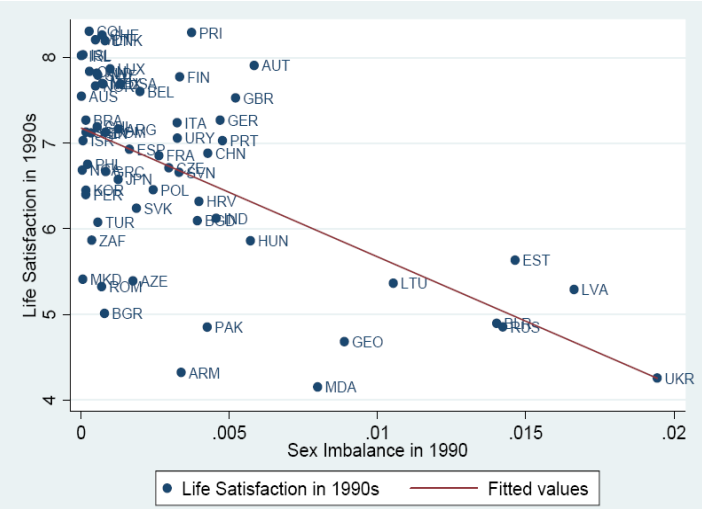

Figure 2: Sex Imbalance and Happiness

Instrumented by sex imbalance, happiness is found to have a positive causal effect on economic growth. The validity of sex imbalance as an instrumental variable depends on whether it correlates with economic growth through channels other than happiness. Having accounted for alternative channels, such as war, institutional quality, political instability, population structure, income inequality, and crime, we find that the estimated

[2]For the effect of income on happiness, see e.g., Di Tella, MacCulloch, and Oswald (2003), Easterlin (1974, 1995, 2001), Frey and Stutzer (2002a, 2003), Frijters, Haisken-DeNew, and Shields (2004), Gardner and Oswald (2007), Oswald (1997), and Stevenson and Wolfers (2008).

effect remains. In fact, GDP per capita as a summary statistic of overall economic and political fundamentals does not correlate with sex imbalance at all, as shown by **Figure 3**. Robustness checks also show that our findings are not driven by outliers, such as Asian countries where gender-specific infanticide, abortion and birth misreporting often happen, and transition countries where alcoholism affects two sexes differently (e.g., Harding, 2008).

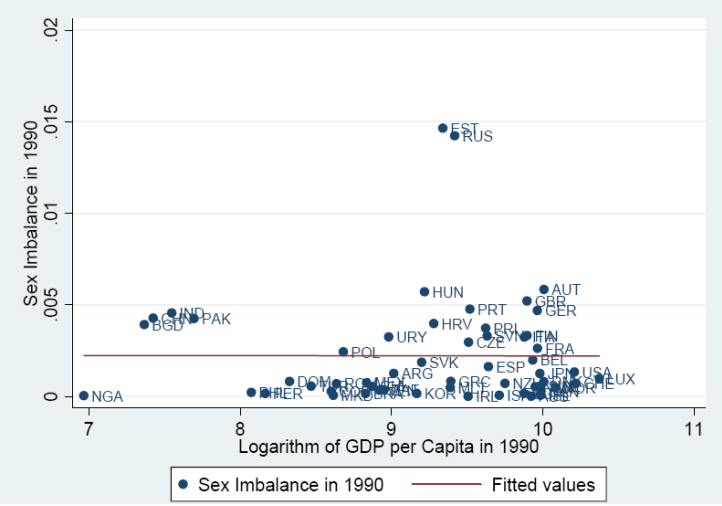

Figure 3: Sex Imbalance and Country Fundamentals

This paper then investigates the channels through which happiness affects economic growth.[3] The first possible channel is consumption and investment. To save *for* rainy days or save *on* rainy days depends on whether happiness raises or lowers the marginal benefit of consumption (Hermalin and Isen, 2008) and happier people are documented to save more with other things held constant (Guven, 2007). Second, happiness links to prolonged life expectancy (e.g., Deeg and van Zonneveld, 1989; Veenhoven, 2008). Short life expectancy depresses investment in physical and human capital (Lorentzen, McMillan, and Wacziarg, 2008) while longevity increases population and thus may lower income per

[3]The possibility of bidirectional causality between economic growth and happiness was first raised by Kenny (1999).

capita (Acemoglu and Johnson, 2007). Third, happiness implies generosity (Kirchsteiger, Rigotti, and Rustichini, 2006) and encourages prosocial behaviors (Lyubomirsky, King, and Diener, 2005); therefore, in a happier society there may be a higher level of trust (social capital), which has been found to promote economic growth (e.g., Helliwell, 1996; Knack and Keefer, 1997; Hall and Jones, 1999; Zak and Knack, 2001). We employ three-stage-least-squares (3SLS) proposed by Tavares and Wacziarg (2001), Wacziarg (2001), and Lorentzen, McMillan and Wacziarg (2008), finding investment and life expectancy as two likely channels.

The literature on happiness economics focuses on three topics:[4] (i) the relationship between happiness and utility (e.g., Frey and Stutzer, 2002b, 2003; Kahneman 2003), (ii) determinants of happiness (e.g., Alesina, Di Tella, and MacCulloch, 2004; Clark and Oswald, 1994; Di Tella, MacCulloch, and Oswald, 2001, 2003; Easterlin, 1974, 1995, 2001; Easterly, 1999; Frijters, Haisken-Denew, and Shields, 2004; Garden and Oswald, 2007; Oswald, 1997), and (iii) the effects of emotions on human behaviors (e.g., Bosman and van Winden, 2002; Elster, 1998; Kirchsteiger, Rigotti, and Rustichini, 2006; Loewenstein, 2000). This paper belongs to the third category but differs from the previous literature by identifying the effect of happiness at the country level. We do not aim to build a new theory but to document unnoticed facts and call for an investigation into the underlying mechanism.

The rest of the paper is organized as follows. Section 2 describes our dataset and the measurement of happiness. Section 3 presents the main results. Section 4 examines possible channels of the happiness effect. Section 5 concludes.

[4]Di Tella and MacCulloch (2006) review the wide use of happiness data in economic studies. For a discussion on policies, see Frank (1997) and Layard (2006).

2 Data

The data on cross-country happiness levels are extracted from the World Database of Happiness compiled by Ruut Veenhoven and his team. Two measures of happiness are used in this paper: life-satisfaction index and happy-life index. They are aggregated from cross-country surveys that ask residents about their levels of subjective happiness. The survey question that generated the life-satisfaction index was "all things considered, how satisfied are you with your life as-a-whole now?" The respondent is required to rate on a 1-10 numerical scale, with higher value indicating more satisfied life.

The survey question that generated the happy-life index is more complex. It used three similar wording patterns and three corresponding numerical scales. The first was "in general, how happy would you say you are?" and the answers range from "very happy (3)" to "not happy (1)." The second was "taking all things together, would you say you are ____" and the answers range from "very happy (4)" to "not at all happy (1)." The third was "how happy do you feel as you live now?" and the answers range from "very happy (5)" to "very unhappy (1)." Ruut Veenhoven and his team conducted Thurstone transformation on these three types of answers to obtain a 1-10 scale numerical measure,[5] with higher value indicating happier life. Due to the complexity of the happy-life index, this paper uses life-satisfaction index as the primary measure.

One may have concerns over the reliability of subjective measures of happiness, which actually have good stability over time, because the factors that influence individual happiness, including income, marital status, health, and education, change very slowly over time. Krueger and Schkade (2007) document that subjective measures of mental well-being, such as the life-satisfaction index, exhibit sufficiently high correlation over time to support research. A similar conclusion was drawn by Lyubomirsky and Lepper (1999).

[5] Detailed descriptions of the variables are available at `http://worlddatabaseofhappiness.eur.nl/hap_quer/hqi_fp.htm`.

Self-reported happiness is also documented to highly correlate with that reported by friends, family members (Sandvik, Diener and Seidlitz, 1993; Costa and McCrae 1988) and clinical experts (Goldings, 1954).

GDP per capita, population, investment ratio, the share of government expenditure in GDP and openness (measured by (import+export)/GDP) are extracted from Penn World Table. Growth rates in GDP per capita and population are annual averages.[6] Education data, measured by average years of schooling, are extracted from the dataset of "Educational Attainment of the Total Population Aged 25 and Over" built by Barro and Lee (2001). The data on trust (social capital) are also from World Database of Happiness (2007). The trust index was obtained in the same fashion as the happiness indices: respondents reported whether they agreed with "most people can be trusted," with "yes" referring to numerical value 3 and "no" to 1. This measure is widely used in studying the effect of social capital on economic performance (e.g., Knack and Keefer, 1997; Zak and Knack, 2001).

Crime rates, measured by "total recorded intentional homicide, completed, per 100,000 inhabitants," are from United Nations Surveys of Crime Trends and Operations of Criminal Justice Systems (1990–2000). Gini coefficient, which measures income inequality, is extracted from World Income Inequality Database. Measures of political rights and civil liberties are computed based on the ratings in the report of *Freedom in the World*, with a lower value indicating better political rights and civil liberties. Life expectancy at birth is from World Development Indicator Database compiled by the World Bank. The data of political instability, measured by the percentage of veto players who drop from the government,[7] are from the Database of Political Institutions compiled by the World

[6] Appendix 1 provides the details on data sources and the construction of variables.

[7] Veto players are defined as "the president and the largest party in the legislature for a presidential system" or "as the prime minister and the parties in the government coalition for a parliamentary system." See Beck, Clarke, Groff, Keefer, and Walsh (2001) for details.

Table 1: Descriptive Statistics

Variable	Obs.	Mean	Std.Dev.	Min	Max
Average Annual Growth Rates of GDP per Capita, 1990s	65	1.57	2.66	-7.2	9.44
Life-satisfaction Index	65	6.69	1.12	4.15	8.31
Happy-life Index	65	6.83	0.81	5.06	8.1
Sex Imbalance	64	0	0	0	0.02
Logarithm of GDP per Capita in 1990	56	9.25	0.81	6.97	10.37
Investment Ratio	56	19.1	7.92	4.51	41.61
Government Expenditure Share	56	19.24	6.67	7.63	35.51
Education	57	7.68	2.32	2.19	12
Openness	56	70.04	57.22	13.97	358.11
Population Growth	65	0.81	0.92	-1.3	3.18
Gini Coefficient	40	35.6	11.02	20	64.7
Civil Liberties	64	2.66	1.39	1	6.8
Political Rights	64	2.26	1.48	1	7
Crime Rate	58	6.43	11.9	0.06	66.58
Political Instability	64	0.16	0.11	0	0.43
War Casualties per Capita	56	0	0.0002	0	0.0009
Suicide Rate	50	13.69	9.6	0.9	38.7
Life Expectancy	64	72.07	5.99	47.46	79.73
Trust	65	1.58	0.28	1.08	2.3

Bank. The data on war casualties per capita, averaged over the period 1980-1988 are from Barro and Lee (1994). Sex imbalance is computed using the estimates and medium-variant projections of "mid-year de facto female population" and "mid-year de facto male population" compiled by the United Nations (2005).

Table 1 summarizes the descriptive statistics of the variables and Appendix 2 lists the main variables across countries.

3 Results

3.1 OLS Results

The following regression is specified:

$$GR_c = \alpha + \beta \cdot HAPPINESS_c + \delta \cdot \ln GDPPC90_c + X_c'\gamma + \varepsilon_c \tag{1}$$

where GR_c is the growth rate of GDP per capita in country c, $HAPPINESS_c$ is overall happiness in country c, $\ln GDPPC90_c$ is the logarithm of GDP per capita in country c in 1990, X_c is a vector of control variables, and ε_c is the error term. The averages of the 1990s are used here to maximize coverage of countries and minimize measurement errors.[8]

Table 2 reports the OLS estimates. In Column 1, happiness is measured by life-satisfaction index and its coefficient is positive and statistically significant. The coefficient of $\ln GDPPC90_c$ is negative, supporting the convergence hypothesis in growth theory, which states that poorer countries grow more quickly on average. Column 2 includes common control variables in growth regressions, including investment ratio, government expenditure share, education level, and openness, and the coefficient of happiness rises and remains significant. With the same specification as in columns 1-2, columns 3-4 use happy-life index as the measure of happiness and show the same result.

We then account for a number of covariates of both economic growth and happiness. First, a country with younger age structure may be happier and age structure potentially affects productivity and labor force of a country. Second, income inequality affects both economic growth (e.g., Barro, 2000; Voitchovsky, 2005) and happiness (Alesina, Di Tella, and MacCulloch, 2004; Morawetz and his coauthors, 1977). Third, the effect of institutions on economic performance has long been established in the literature (see, e.g.,

[8] Happiness may have measurement errors, and within-group estimator may exaggerate measurement errors (see Hauk and Wacziarg (2007)).

Table 2: OLS Estimates

	1	2	3	4
Happiness Measure	Life Satisfaction		Happy Life	
Happiness	1.39***	1.62***	1.44***	1.64***
	(3.39)	(3.81)	(3.11)	(3.03)
Initial Logarithm of GDP per Capita	-0.92	-2.26***	-0.53	-1.90**
	(-1.63)	(-3.28)	(-1.09)	(-2.31)
Investment Ratio		0.13***		0.11**
		(2.69)		(2.08)
Government Expenditure Share		0.04		0.05
		(0.96)		(1.04)
Education		0.05		0.16
		(0.34)		(0.94)
Openness		0.01		0.01
		(1.51)		(1.40)
Constant	0.63	7.43*	-3.42	3.12
	(0.17)	(1.75)	(-0.81)	(0.60)
Number of observation	56	53	56	53
R-square	0.23	0.42	0.18	0.34
F-statistic	6.77	5.83	4.93	3.14
p-value for F-statistic	0.00	0.00	0.01	0.01

Note: t-values, adjusted for heteroskadasticity, are reported in parentheses. *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

Acemoglu, Johnson, and Robinson, 2001, 2002; Tavares and Wacziarg, 2001) and institutions are also associated with happiness (Frey and Stutzer, 2001a, Chapter 8). Fourth, crimes depress investment and lower life quality. As shown in **Table 3**, having all these factors accounted for, the main findings from Table 2 still hold.

3.2 Two-Stage-Least-Squares (2SLS) Results

Happiness is then instrumented by sex imbalance, which keeps normal partnership and sexual activity from generating happiness. Happiness is strongly associated with marriage (Clark and Oswald, 2002; Kohler, Behrman, and Skytthe, 2005; Stutzer and Frey, 2006) and sexual activity (Blanchflower and Oswald, 2004); therefore, sex imbalance causes failures in mating and thus reduces happiness of individuals in a given society. Sex

Table 3: OLS Estimates, Robustness Check

	1	2	3	4	5
Happiness Measure	Life Satisfaction				
Happiness	1.60***	1.79***	1.48***	1.58***	1.76***
	(3.51)	(3.13)	(3.15)	(3.60)	(5.02)
Logarithm of GDP per capita in 1990	-2.23***	-3.06***	-2.63***	-2.50***	-2.19***
	(-2.92)	(-3.31)	(-3.56)	(-3.12)	(-3.47)
Investment Rate	0.13**	0.10	0.14***	0.14**	0.13**
	(2.57)	(1.54)	(2.70)	(2.63)	(2.30)
Government Expenditure Share	0.04	-0.01	0.04	0.04	0.06
	(0.99)	(-0.09)	(0.83)	(0.86)	(1.30)
Education	0.06	-0.03	0.00	0.04	-0.11
	(0.37)	(-0.16)	(0.01)	(0.24)	(-0.96)
Trade	0.01	0.01**	0.01	0.01	0.00
	(1.41)	(2.12)	(1.50)	(1.35)	(0.31)
Population Growth	0.06				
	(0.19)				
Gini Index		-0.06			
		(-1.10)			
Civil Liberties			-0.34		
			(-0.80)		
Political Rights					
				-0.18	
Crime Rate				(-0.44)	-0.03
					(-1.23)
Constant	7.18	18.06	12.67*	10.19	6.95
	(1.51)	(1.64)	(1.94)	(1.57)	(1.65)
Number of observation	53	34	52	52	47
R-square	0.42	0.53	0.44	0.43	0.56
F-statistic	6.05	4.45	4.84	4.8	5.08
p-value for F-statistic	0.00	0.00	0.00	0.00	0.00

Notes: t-values, adjusted for heteroskedasticity, are reported in parentheses. *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

imbalance is measured by $(1 - M/F)^2$, where M and F refer to the shares of male and female population, respectively. The 2SLS results are reported in **Table 4**. In Table 4, sex imbalance is shown to have a negative effect on happiness, which in turns has a positive effect on economic growth. These findings are robust to aforementioned control variables (column 2) as well as alternative measure of $HAPPINESS$ (columns 3-4).

The validity of sex imbalance as an instrumental variable rests on two conditions: (i)

Table 4: 2SLS Results

	1	2	3	4
Happiness Measure	Life Satisfaction		Happy Life	
Panel A: Second-stage estimates. Dependent variable: Growth rate				
Happiness	1.79***	2.01***	2.07***	2.53***
	(3.18)	(3.55)	(3.08)	(3.58)
Logarithm of GDP per Capita in 1990	-1.16**	-2.58***	-0.70	-2.39**
	(-2.38)	(-4.09)	(-1.63)	(-2.99)
Investment Rate		0.14***		0.12***
		(3.57)		(2.65)
Government Expenditure Share		0.06		0.08
		(1.37)		(1.62)
Education		0.07		0.26
		(0.48)		(1.33)
Openness		0.00		0.01
		(1.38)		(1.29)
Constant	-0.10	6.99*	-6.31	0.02
	(-0.02)	(1.88)	(-1.10)	(0.00)
Panel B: First-stage estimates. Dependent variable: Happiness				
Sex Imbalance	-124.08***	-125.24***	-107.51***	-99.66***
	(-4.40)	(-4.94)	(-4.27)	(-3.69)
Logarithm of GDP per Capita in 1990	0.55***	0.69**	0.26***	0.47**
	(4.86)	(2.64)	(3.05)	(2.25)
Investment Rate		-0.02		-0.01
		(-1.01)		(-0.64)
Government Expenditure Share		-0.01		-0.01
		(-0.46)		(-0.99)
Education		-0.01		-0.09
		(-0.26)		(-1.64)
Openness		0.00		0.00
		(0.40)		(0.16)
Constant	2.15*	1.55	4.86***	3.99**
	(1.95)	(0.82)	(6.04)	(2.58)
Panel C: Test statistics				
Anderson Canonical Correlation LR Statistic	[15.11]***	[15.93]***	[15.45]***	[14.07]***
Cragg-Donald Chi-Statistic	[17.39]***	[18.63]***	[17.83]***	[16.16]***
Shea Test of Excluded Instruments	[19.33]***	[24.37]***	[18.21]***	[13.62]***
Cragg-Donald F-Statistic	16.44	16.12	16.86	13.98
Number of observation	55	52	55	52

Notes: t-values, adjusted for heteroskedasticity, are reported in parentheses. *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

there must be a strong correlation between sex imbalance and happiness, as shown earlier;[9] (ii) sex imbalance cannot correlate with economic growth through *any* channel other than happiness. Condition (ii) is not directly testable, so we carry out five robustness checks

[9] Anderson canonical correlation test, Cragg-Donald test, and Shea test also confirm the strong correlation.

to indirectly address it.[10] The first check is to examine whether sex imbalance correlates with economic growth through known channels. In **Table 5**, the regression includes crime rate, political instability, population growth, Gini index, civil liberties, political rights, and war causalities per capita, while the previous findings hold.

The second check is to examine whether the results are driven by outliers. In Asian countries, son preference causes some parents to commit infanticide, gender-specific abortion and concealment of births (e.g., Hull, 1990), while in transition countries alcoholism is a severe social problem that may affect two sexes differently (e.g., Harding, 2008). In **Table 6**, dummy variables for Asian and transition countries are controlled for.[11] Again, the findings do not change.

The third check is based on the premise that, if sex imbalance correlates with economic growth only through happiness, it would have no correlation with economic growth conditional on happiness. Column 1 of **Table 7** shows that sex imbalance is negatively and significantly associated with economic growth; however this correlation, as shown in column 2, disappears once happiness is included in the regression. Specifically, not only the coefficient of sex imbalance shrinks substantially from -222.51 to -54.21, but the t-statistic also falls from -2.22 to -0.54. Columns 3-5 incorporate additional control variables and the alternative measure of happiness, both leading to the same conclusion.

When looking at Figure 2, one might have the concern that the data pattern is skewed to the right. To address possible bias caused by this, we follow Nunn and Puga (2007) to transform the sex-imbalance measure using two methods. As the fourth check, **Figure 4** plots the correlation between happiness and the logarithm transformation of sex imbalance and column 1 of **Table 8** reports the corresponding 2SLS estimates. The previous

[10] In robustness checks, we use life-satisfaction index as the measure of happiness. The results from studying the happy-life index (available upon request) are very similar.

[11] Another approach to address outlier countries is to exclude them. This approach shrinks the sample size but leads to the same findings. Details are available upon request.

Table 5: 2SLS Estimates, Robustness Check I

	1	2	3	4	5	6	7
Happiness Measure	Life Satisfaction						
Panel A: Second-stage estimates. Dependent variable: Growth rate							
Happiness	2.18***	2.05***	2.12***	2.37***	1.90***	1.96***	2.25***
	(5.44)	(3.95)	(2.88)	(4.23)	(3.45)	(3.85)	(4.74)
Logarithm of GDP per Capita in 1990	-2.50***	-2.62***	-2.69***	-3.27***	-2.90***	-2.97***	-3.31***
	(-4.44)	(-4.45)	(-3.49)	(-4.66)	(-4.44)	(-4.08)	(-6.42)
Investment Rate	0.13***	0.15***	0.14***	0.13**	0.15***	0.15***	0.15***
	(2.67)	(3.15)	(3.47)	(2.38)	(3.34)	(3.47)	(3.47)
Government Expenditure Share	0.07	0.06	0.05	0.01	0.05	0.05	0.07
	(1.49)	(1.35)	(1.35)	(0.20)	(1.25)	(1.22)	(1.53)
Education	-0.09	0.06	0.06	0.08	0.03	0.05	0.23
	(-0.86)	(0.43)	(0.41)	(0.48)	(0.20)	(0.38)	(1.45)
Openness	0.00	0.00	0.00	0.01**	0.01	0.01	0.01*
	(0.32)	(0.94)	(1.34)	(1.96)	(1.34)	(1.37)	(1.76)
Crime Rate	-0.03						
	(-1.17)						
Political Instability		-0.65					
		(-0.30)					
Population Growth			-0.11				
			(-0.28)				
Gini Index				-0.03			
				(-0.76)			
Civil Liberties					-0.29		
					(-0.85)		
Political Rights						-0.28	
						(-0.87)	
War Casualties per Capita							-2238.01**
							(-2.06)
Constant	6.69*	7.08*	7.40**	12.86*	11.44*	11.27**	10.52***
	(1.74)	(1.94)	(1.97)	(1.65)	(1.83)	(1.96)	(2.88)
Panel B: First-stage estimates. Dependent variable: Happiness							
Sex Imbalance	-134.67***	138.08***	107.91***	119.93***	-117.87***	-127.63***	-146.16***
	(-5.02)	(-5.56)	(-2.75)	(-4.83)	(-4.27)	(-5.32)	(-7.07)
Panel C: Test statistics							
Anderson Canonical Correlation LR Statistic	[16.79]***	[19.95]***	[9.32]***	[12.30]***	[15.18]***	[16.90]***	[4.15]**
Cragg-Donald Chi-Statistic	[20.18]***	[24.42]***	[10.21]***	[14.91]***	[17.68]***	[20.03]***	[60.77]***
Shea Test of Excluded Instruments	[25.22]***	[30.92]***	[7.58]***	[23.30]***	[29.74]***	[28.29]***	[49.97]***
Cragg-Donald F-Statistic	16.74	20.59	8.64	11.3	14.91	16.89	49.97
Number of observation	47	51	52	33	51	51	45

Notes: t-values, adjusted for heteroskedasticity, are reported in parentheses. *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

results are robust to this transformation. The logarithm transformation of sex imbalance in Figure 4 is now slightly left-skewed; then, we use the zero-skewness Box-Cox power

Table 6: 2SLS Estimates, Robustness Check II

	1	2
Happiness Measure	Life Satisfaction	
Panel A: Second-stage estimates. Dependent variable: Growth rate		
Happiness Index	1.92***	1.94**
	(3.84)	(2.05)
Logarithm of GDP per Capita in 1990	-2.00***	-2.59***
	(-3.29)	(-4.13)
Investment Rate	0.10*	0.14***
	(1.96)	(3.46)
Government Expenditure Share	0.05	0.06
	(1.24)	(1.48)
Education	0.09	0.09
	(0.63)	(0.42)
Openness	0.00	0.01
	(1.29)	(1.14)
Asian Countries Dummy	1.31*	
	(1.83)	
Transition Countries Dummy		-0.18
		(-0.14)
Constant	2.89	7.49
	(0.73)	(1.36)
Panel B: First-stage estimates. Dependent variable: Happiness		
Sex Imbalance	-128.49***	-83.50***
	(-4.55)	(-2.73)
Panel C: Test statistics		
Anderson Canonical Correlation LR Statistic	[16.87]***	[3.60]*
Cragg-Donald Chi-Statistic	[19.93]***	[8.81]***
Shea Test of Excluded Instruments	[20.66]***	[7.45]***
Cragg-Donald F-Statistic	16.86	7.45
Number of observation	52	52

Notes: t-values, adjusted for heteroskadasticity, are reported in parentheses. *, **, *** represent significance levels of 10%, 5%, and 1%, respectively. The first stage of 2SLS includes the same controls as the second stage, and their coefficients are not reported due to space limit (available upon request).

transformation in **Figure 5** and column 2 of Table 8 reports the corresponding 2SLS estimates. Clearly, the relationship between happiness and transformed sex imbalance is not driven by outliers. The fifth check is to repeat the analysis using two sub-samples, the western- and eastern-hemisphere countries, and the results are reported in columns 3–4 of Table 8, which show the same finding as before.

Table 7: 2SLS Estimates, Robustness Check III

	1	2	3	4	5
Happiness Measure	Life Satisfaction			Happy Life	
Happiness		1.36***	1.62***	1.18***	1.32***
		(2.80)	(3.70)	(2.30)	(2.39)
Sex Imbalance	-222.51**	-54.21	-49.67	-95.78	-120.68
	(-2.22)	(-0.54)	(-0.55)	(-0.95)	(-1.26)
Logarithm of GDP per Capita in 1990	-0.16	-0.91	-2.31***	-0.47	-1.82**
	(-0.34)	(-1.44)	(-3.22)	(-0.90)	(-2.07)
Investment Rate			0.13***		0.11**
			(2.76)		(2.04)
Government Expenditure Share			0.05		0.06
			(1.18)		(1.15)
Education			0.06		0.15
			(0.41)		(0.85)
Openness			0.01		0.01
			(1.34)		(1.32)
Constant	3.76	0.84	7.61*	-1.98	4.85
	(0.84)	(0.24)	(1.82)	(-0.49)	(0.93)
Number of observation	55	55	52	55	52
R-square	0.1	0.27	0.49	0.20	0.38
F-statistic	2.8	6.15	5.65	4.23	3.43
p-value for F-statistic	0.07	0.00	0.00	0.01	0.01

Notes: t-values, adjusted for heteroskedasticity, are reported in parentheses. *, **, *** represent significance levels of 10%, 5%, and 1%, respectively.

4 Channel investigation

As mentioned earlier, happiness may affect economic growth through investment, life expectancy, and trust (social capital). This section aims to quantitatively evaluate their relative importance. Following Tavares and Wacziarg (2001), Wacziarg (2001), and Lorentzen, McMillan, and Wacziarg (2008), we use 3SLS estimation, which allows computing a single covariance matrix for all the estimates and therefore facilitates complex inferences on the functions of parameters across equations. The regression results are reported in **Table 9**. As shown by columns 2-3, happiness significantly raises investment ratio and life expectancy, while its effect on trust is insignificant (column 4). In column 1, investment ratio and life expectancy are positively associated with growth rate.[12]

We then combine the estimates in columns 2-4 with those in column 1 to calculate the

[12]Lorentzen, McMillan, and Wacziarg (2008) find that early death discourages human capital investment by reducing return to human capital (p.88).

Table 8: 2SLS Estimates, Robustness Checks IV and V

	1	2	3	4
Panel A: Second-stage estimates. Dependent variable: Growth rate				
Happiness	2.05**	1.84**	1.63**	2.41***
	(2.22)	(3.85)	(2.09)	(3.02)
Logarithm of GDP per Capita in 1990	-2.61***	-2.45***	-2.32***	-2.44**
	(-3.10)	(-3.22)	(-3.19)	(-2.50)
Investment Rate	0.14***	0.14***	0.18***	0.13
	(3.39)	(3.33)	(3.33)	(1.22)
Government Expenditure Share	0.06	0.05	0.07*	0.14
	(1.36)	(1.27)	(1.80)	(1.04)
Education	0.07	0.06	-0.12	0.38
	(0.49)	(0.44)	(-0.90)	(1.38)
Openness	0.00	0.00	0.00	0.02
	(1.36)	(1.42)	(0.30)	(1.29)
Constant	6.96*	7.14*	7.62**	-1.26
	(1.87)	(1.85)	(1.97)	(-0.23)
Panel B: First-stage estimates. Dependent variable: Happiness				
Sex Imbalance			-70.77*	-149.66***
			(-1.81)	(-7.48)
Logarithm of Sex Imbalance	-0.16**			
	(-2.65)			
Zero-Skewness Box-Cox Transformation of Sex Imbalance		-0.70***		
		(-2.79)		
Panel C: Test statistics				
Anderson Canonical Correlation LR Statistic	[7.90]***	[10.02]***	[2.82]*	[15.48]***
Cragg-Donald Chi-Statistic	[8.53]***	[11.05]***	[2.95]*	[23.92]***
Shea Test of Excluded Instruments	[7.00]**	[7.80]***	[3.29]*	[55.91]**
Cragg-Donald F-Statistic	7.38	9.56	2.32	15.11
Number of observation	52	52	33	19

Notes: t-values, adjusted for heteroskedasticity, are reported in parentheses. *, **, *** represent significance levels of 10%, 5%, and 1%, respectively. The first stage of 2SLS includes the same controls as the second stage, and their coefficients are not reported due to space limit (available upon request).

total effect of happiness on economic growth. Column 3 of **Table 10** presents the relative importance of each channel, evaluated by the product of the coefficient of happiness in each channel (column 2) and the coefficient of the channel in growth equation (column 1).[13] The total effect is 1.83. Recalling that the total effect of happiness was estimated to be 2.01 (column 2, Table 4), slightly larger than 1.83, we speculate that there are other unknown channels through which happiness works.

[13] As in Wacziarg (2001), t-statistics are obtained by "computing linear approximations of the products of the parameters around the estimated parameter values and applying the usual formula for the variance of linear functions of random variables to this linear approximation."

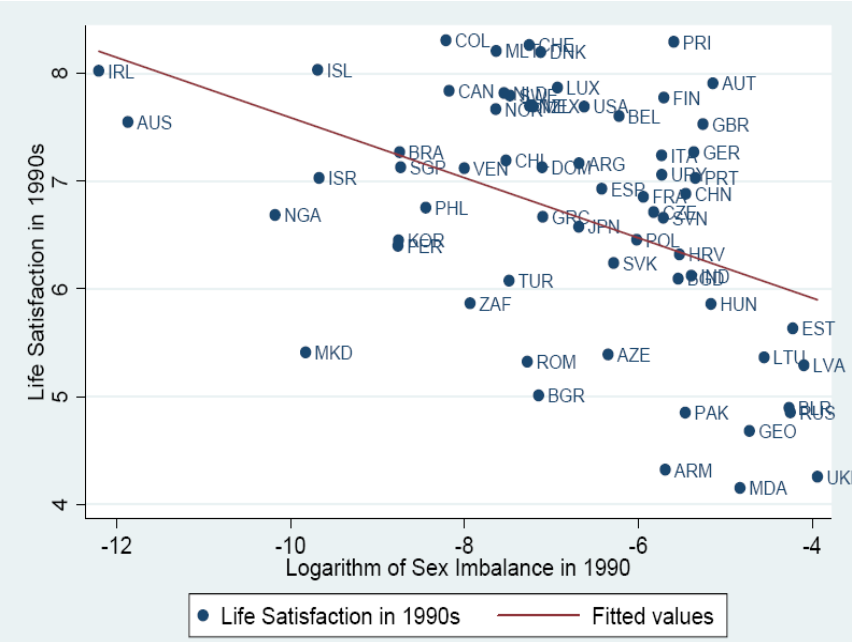

Figure 4: Logarithm of Sex Imbalance and Happiness

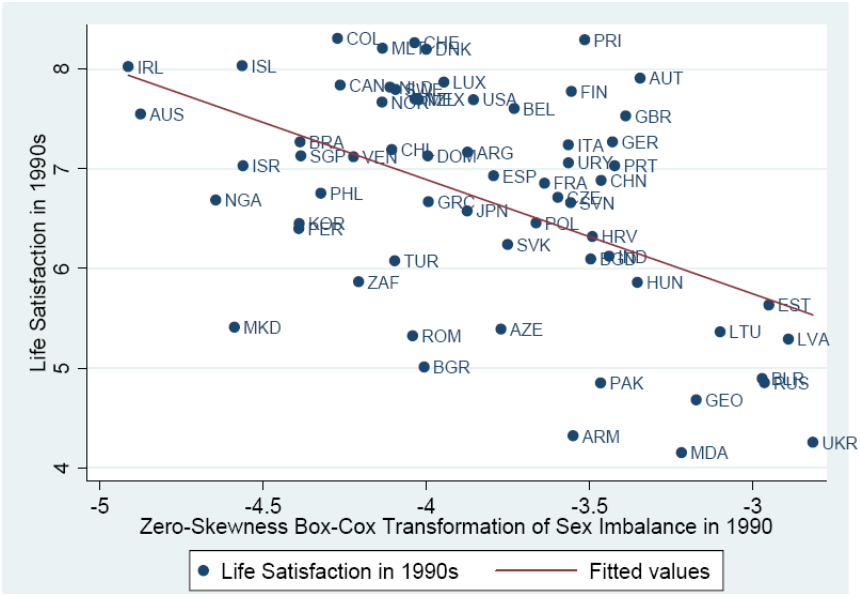

Figure 5: Zero-Skewness Box-Cox Transformation of Sex Imbalance and Happiness

5 Conclusion

Happiness is an important factor in determining individual behaviors. To date, most effort in happiness economics has been devoted to understanding the determinants of

Table 9: 3SLS Estimates

	1	2	3	4
Dependent Variable	Growth Rate	Investment	Life Expectancy	Trust
Happiness		3.57**	2.57***	-0.02
		(2.02)	(2.97)	(-0.28)
Logarithm of GDP per Capita in 1990	-3.92***	2.25	4.50***	0.05
	(-3.28)	(1.27)	(6.64)	(0.53)
Investment Rate	0.19***			
	(2.87)			
Life Expectancy	0.45**			
	(2.27)			
Trust	-0.26			
	(-0.15)			
Sex Imbalance				
Government Expenditure Share			-0.00	
			(-0.05)	
Education		0.29		0.06***
		(0.75)		(3.01)
Openness		0.06***		
		(4.07)		
Population		1.74***		
		(3.76)		
Political Instability		-2.98	2.01	
		(-0.45)	(0.62)	
Constant	2.08	-49.22***	12.94**	0.85*
	(0.41)	(-3.60)	(2.44)	(1.70)
Number of observation	51	51	51	51
R-square	0.3	0.36	0.76	0.25
Chi2-statistic	23	44.26	161.98	24.26
p-value for Chi2-statistic	0.00	0.00	0.00	0.00

Notes: t-values are reported in parentheses. *, **, *** represent significance of 10%, 5%, and 1%, respectively.

Table 10: Channel Investigation, Summary

	Channel on Growth	Happiness on Channel	Happiness on Growth
Investment	0.19	3.57	0.68
	(2.87)	(2.02)	(1.63)
Trust	-0.26	-0.02	0.01
	(-0.15)	(-0.28)	(0.13)
Life Expectancy	0.45	2.57	1.15
	(2.27)	(2.97)	(2.21)

Notes: Columns 1-2 are extracted from Table 9. Coefficients in column 3 are products of their counterparts in Columns 1-2. Standard errors in column 3 are calculated by computing linear approximations of the coefficient products.

happiness and the impacts of happiness on microeconomic behaviors. This paper takes a different approach by studying the impact of happiness on economic growth. We first document a robust correlation between happiness and economic growth, and then instrument happiness using sex imbalance, which impedes normal mating and thus negatively affects happiness. The 2SLS results show that countries with happier residents grow faster. The results are robust to several different specifications. In addition, to understand how happiness affects economic growth, we implement a channel investigation and find that happiness encourages investment and extends life expectancy, both of which promote economic growth. These findings suggest addressing the mental misery of populace in low-income countries apart from treating their economic difficulties.

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Appendix 1: Data sources

The data of *Political Rights* and *Civil Liberties*, two institution measures, are available at http://www.freedomhouse.org/uploads/fiw/FIWAllScores.xls We use the averages of countries during the 1990s. The data of GDP per capita are from the *Penn World Table*, and the average growth rate per year is calculated by the formula y=x(1+r)^n, where r is the growth rate, x and y are the values of GDP per capita in the initial year (1989) and the last year (1999), respectively, n=10. The same data source and method are used when we calculate average growth rate of population per year. The data of the shares of investment and government spending in GDP, GDP per capita in the 1990, and trade are also from the *Penn World Table 6.2*. Trade is measured as (import+export)/GDP. We use the natural log of GDP per capita.

Happy-life index of the 1990s and life-satisfaction index of the 1990s are extracted from the *World Database of Happiness*, which we received from Ruut Veenhoven. In particular, these two measures belong to the subset *Happiness in Nations*. The details of these two happiness measures have been discussed in the text. Suicide rates and our trust measure are also from this database.

The data of female and male population are from United Nations Statistics Division. They are compiled in 2005 and available at http://unstats.un.org/pop/dVariables/DRetrieval.aspx.

Education is measured as "Educational Attainment of the Total Population Aged 25 and Over" and the data are from "International Data on Educational Attainment: Updates and Implications" by Barro and Lee (2001). See http://www.economics.harvard.edu/faculty/barro/data_sets_barro for details.

Our measure of political instability is from the database of political institutions compiled by the World Bank in 2004. It is measured by "percent of veto players who drop from the government in any given year."

Life expectancy at birth (unit: years) are from the WDI database of the World Bank. The WDI database is publicly available as long as one's institution subscribes to it. We calculate the averages of countries during the 1990s.

Gini coefficients are from the *World Income Inequality Database*. We calculate the averages of countries during the 1990s. The crime rates are the "total recorded intentional homicide, completed," given per 100,000 inhabitants. They are from *United Nations Surveys of Crime Trends and Operations of Criminal Justice Systems*, which can be downloaded at http://www.unodc.org/unodc/en/data-and-analysis/Seventh-United-Nations-Survey-on-Crime-Trends-and-the-Operations-of-Criminal-Justice-Systems.html. We calculate the 1990s averages of countries.

War causalities per capita are from Barro and Lee (1994).
See http://www.nber.org/pub/barro.lee/readme.txt

Appendix 2: Main Variables across Countries

Country	Growth rate in the 1990s	Life-satisfaction index in the 1990s	Happy-life Index in the 1990s	Sex imbalance in 1990
Argentina	3.19	7.17	7.06	0.0013
Armenia	4.36	4.32	5.61	0.0034
Australia	2.14	7.55	7.88	0.0000
Austria	2.01	7.91	7.54	0.0058
Azerbaijan	-1.04	5.39	6.63	0.0017
Bangladesh	1.52	6.10	7.01	0.0039
Belarus	7.23	4.89	5.22	0.0140
Belgium	1.73	7.61	7.74	0.0020
Brazil	-0.44	7.27	6.90	0.0002
Bulgaria	-2.40	5.01	5.24	0.0008
Canada	1.51	7.84	7.34	0.0003
Chile	4.69	7.19	6.94	0.0005
China	9.44	6.88	6.86	0.0043
Colombia	1.27	8.31	7.61	0.0003
Croatia	-2.41	6.32	6.43	0.0040
Czech Republic	-0.24	6.71	6.80	0.0030
Denmark	2.02	8.20	7.90	0.0008
Dominican Republic	3.50	7.13	6.93	0.0008
Estonia	-1.13	5.63	5.93	0.0146
Finland	0.62	7.78	7.30	0.0033
France	1.47	6.86	7.50	0.0026
Georgia	-3.06	4.68	6.01	0.0089
Germany	1.80	7.27	6.57	0.0047
Greece	1.11	6.67	6.65	0.0008

Hungary	0.47	5.86	6.22	0.0057
Iceland	1.31	8.04	8.06	0.0001
India	3.48	6.12	6.79	0.0046
Ireland	6.42	8.02	7.75	0.0000
Israel	2.80	7.03	6.16	0.0001
Italy	1.33	7.24	6.54	0.0032
Japan	1.29	6.58	7.28	0.0012
Korea, Republic of	5.31	6.45	6.62	0.0002
Latvia	3.32	5.29	5.82	0.0166
Lithuania	2.12	5.36	5.86	0.0105
Luxembourg	3.83	7.87	7.71	0.0010
Macedonia	-0.86	5.41	6.11	0.0001
Malta	4.46	8.21	7.32	0.0005
Mexico	1.44	7.69	6.72	0.0007
Moldova	-3.84	4.15	5.16	0.0080
Netherlands	2.31	7.82	7.92	0.0005
New Zealand	1.51	7.70	7.36	0.0007
Nigeria	0.42	6.69	6.95	0.0000
Norway	3.22	7.67	7.32	0.0005
Pakistan	1.40	4.85	6.95	0.0043
Peru	0.96	6.40	6.48	0.0002
Philippines	0.89	6.76	7.24	0.0002
Poland	2.81	6.46	6.09	0.0024
Portugal	2.68	7.03	6.69	0.0048
Puerto Rico	2.80	8.30	7.77	0.0037
Romania	-1.54	5.32	5.60	0.0007
Russia	-3.99	4.85	5.06	0.0142

Singapore	4.24	7.13	7.77	0.0002
Slovak Republic	-0.56	6.24	5.84	0.0019
Slovenia	1.56	6.66	6.07	0.0033
South Africa	0.29	5.87	6.49	0.0004
Spain	2.33	6.93	7.12	0.0016
Sweden	1.10	7.80	7.73	0.0006
Switzerland	0.46	8.27	7.84	0.0007
Turkey	2.10	6.08	7.46	0.0006
Ukraine	-7.20	4.26	5.24	0.0194
United Kingdom	1.87	7.53	7.41	0.0052
United States	2.17	7.69	7.40	0.0013
Uruguay	3.21	7.06	6.87	0.0032
Venezuela	-0.11	7.12	8.10	0.0003

Note: Numbers are rounded to the nearest hundredth in this table in the 2^{nd}, 3^{rd}, and 4^{th} columns, and to the nearest 10000^{th} in the 5^{th} column. More accurate data are available upon request.