Happiness and Development: The Effect of Mental Well-being on Economic Growth

Ben Li∗, Yi Lu†
∗ *Department of Economics, University of Colorado at Boulder*
† *Faculty of Business and Economics, University of Hong Kong*

Version: November 2008

This paper examines the impact of overall happiness of citizens on economic growth across countries. We first document a robust positive correlation between overall happiness level and economic growth across countries, and then exploit the variation in sex imbalance, a factor that 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. Other things being equal, a one-standard-deviation increase in happiness raises growth rate by approximately two percentage points. In addition, we find that life expectancy and investment ratio are two possible channels through which happiness works.

Key Words: Happiness, Economic Growth, Life expectancy, Investment Ratio.
Subject Classification: (JEL codes) O40, I3, J01.

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

1. INTRODUCTION

Happiness matters much for the life of human being, just as Russell said. For example, happiness generates intelligence and vigor, while sadness causes apathy and indolence.[1] Does the happiness of residents have impacts on the economic growth of a country?[2]

Higher income has been believed to boost happiness for long,[3] whereas, to our knowledge, the relation between growth rate and happiness is less clear. Economic growth, which may involve excessive competition, pollution, materialism, and social anxiety, does not necessarily lead to more happiness. For instance, East-Asian countries are reported to score low in happiness surveys (Ng, 2002). This paper first documents a positive correlation between economic growth and happiness, reassuring us that success in economic growth is overall associated with being happy rather than unhappy.

Figure 1 displays a positive correlation between the overall happiness level and the growth rate of Gross Domestic Product (GDP) per capita across countries in the 1990s. For example, Denmark with an overall happiness level of 8.20 experienced an average annual growth rate of 2.02% in the 1990s, while the GDP per capita in Moldova, which has an overall happiness level of 4.15, fell at an average annual rate of 3.84% during the same period. Our ordinary-least-squares (OLS) regressions further confirm this positive correlation. The OLS results might be biased due to endogeneity. For example, some missing variables that correlate both growth rate and happiness can induce a spurious positive correlation between them. Meanwhile, the rise of income can improve residents' life quality, and thus boost their happiness. We then control for a host of variables that

[1] Diener (1984) provides a review of psychology literature regarding the effects of subjective mental well-being on human behaviors.

[2] In this paper, we focus on the overall happiness level, rather than specific forms of happiness such as job satisfaction. The relation between job satisfaction and overall happiness is discussed in Booth and van Ours (2008).

[3] A number of studies have investigated the effects of income on happiness, 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), and Oswald (1997).

may affect both economic growth and happiness, and arrive at the same result.

To further address the potential endogeneity, we exploit the exogenous variation in sex imbalance, a phenomenon which impedes normal mating in the current monogamy-dominated world, as an instrumental variable (IV) for happiness. Partnership, including marriage and cohabitation, and sexual activities have been found by researchers as important sources of happiness (e.g., Blanchflower and Oswald, 2004). Sex ratios that deviate from the normal level cause difficulty in mating and normal reproduction, and thus depress the happiness of populace. To remove the direction of the deviation in sex ratio, we define sex imbalance as $(1 - M/F)^2$, where M and F are male and female population, respectively. Figure 2 exhibits a strong negative correlation between sex imbalance and happiness across countries.

Instrumented by sex imbalance, happiness is found to have a positive causal effect on economic growth. Specifically, a one-standard-deviation increase in happiness can raise growth rate by approximately two percentage points. The validity of our IV hinges upon two conditions: the relevance condition and the exclusion restriction. The relevance condition is confirmed by the aforementioned significant correlation between sex imbalance and happiness, as well as several statistical tests (i.e., Anderson canonical correlation LR statistic). Meanwhile, the Shea test for excluded instrument and the Cragg-Donald F-statistic rule out the concern for weak instrument.

The exclusion condition requires that sex imbalance should affect growth rate only through happiness. We conduct four tests to counter-check this condition. First, if sex imbalance affects growth rate only through happiness, sex imbalance would have no impact when it is included together with happiness in the growth regression. Second, we control for potential channels other than happiness through which sex imbalance may affect growth rate. Third, we include other variables that may correlate with both happiness and growth rate. Fourth, we experiment with a sub-sample that excludes Asian countries, where gender-specific infanticide, abortion, and birth misreporting, which potentially distort sex ratio, are reported (e.g., Hull, 1990). Our results are robust to all these tests.

One may still have a concern that sex imbalance is not exogenous. Sex imbalance of human birth vary within and across human populations. The reason for this variation

is not fully understood, while it has been found to be associated with race, birth order, sexes of existing offspring, war, handedness of parents, smoking, timing of fertilization, and parental hormone levels (Gray and his coauthors, 1998; James, 2008; Sieff, 1990; Tremblay, Vezina, Houde, and Chung, 2003). Among these covariates, social factors such as race and war can be controlled for, while others are arguably exogenous to economic growth.[4] Since the data on sex ratio at birth are primarily available in birth certificates and hospital registries, which unfortunately causes data from the countries without good medical institutions unavailable or unreliable,[5] we use adult sex ratio in this paper. Data on male and female population are readily available in any country where government is able to perform basic functions. The concern is instead that economic factors would cause adult sex ratio to deviate from sex ratio at birth. However, the data do not support this claim. As shown by Figure 3, sex imbalance is uncorrelated with GDP per capita (correlation coefficient: 0.03), and regression analysis leads to the same conclusion.

We then take a further step to investigate the potential channels through which happiness may affect economic growth. Following Tavares and Wacziarg (2001), Wacziarg (2001), and Lorentzen, McMillan, and Wacziarg (2008), we use the three-stage-least-squares (3SLS) estimation. The results identify investment ratio and life expectancy as two potential channels.

Recent literature on happiness economics focuses on three questions:[6] (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; Frey and Stutzer, 2002a, 2002b; Frijters, Haisken-Denew, and Shields, 2004; Garden and Oswald, 2007; Helliwell, 2002; 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; Hermalin and Isen, 2008;

[4] As for the use of the exogeneity in sex, see Oswald and Powdthavee (forthcoming).

[5] Notably, a large number of babies in less developed countries are not delivered in hospitals. Research on sex ratio at birth usually chooses countries with well established medical and statistical systems (e.g., Davis, Webster, Stainthorpe, Chilton, Jones, and Doi, 2007, concerning Japan and United States).

[6] This is a unexhaustive list of related studies. Di Tella and MacCulloch (2006) review the wide uses of happiness data in economics studies. Economics was born as a discipline closely associated with the idea of happiness, whereas economists' interest in happiness has languished since World War II, due to the flourishing of ordinal utility theory. In the past decade, such interest has begun to resurface (Dixon, 1997; Ng, 1997). Happiness data are also used in policy evaluation, such as designing compensation scheme (e.g., van Praag and Baarsma, 2005).

Loewenstein, 2000).[7] This paper belongs to the third category but differs from previous literature by identifying the effect of happiness from an aggregate perspective. We aim not to build a new theory, but to document some unnoticed facts and call for effort into the investigation of the underlying mechanism. Happiness is worth pursuing for its own sake, and would be even more attractive if it generates economic gains. As a result, policy makers could be more affirmative on policies that potentially boost happiness, if happiness-induced economic gains do exist.[8]

The rest of the paper is organized as follows. Section 2 discusses how happiness affects economic growth. Section 3 describes our dataset and the measurement of happiness. Section 4 presents our empirical results, including robustness checks. Section 5 investigates the possible channels of the happiness effect. Section 6 concludes.

2. HOW DOES HAPPINESS AFFECT ECONOMIC GROWTH?

The possibility of bidirectional causality between economic growth and happiness is first raised by Kenny (1999). In a literature survey on happiness economics, Frey and Stutzer (2002b) echo this open question and list it as a research topic worth further investigation. A commonly asked question regarding happiness economics is whether happiness, usually regarded as a transitory feeling, has any long-lasting effects on human behaviors. This is not a concern in our paper. First, our measure of happiness, as discussed in Section 3, emphasizes particularly on the long-term mental satisfaction rather than transitory feeling. Second, recent literature shows that even transitory feeling can generate long-lasting consequences by affecting current decisions (Hermalin and Isen, 2008).[9]

How does happiness affect economic growth? Based on past studies in economics and sociology, we propose three possible channels. The first channel is consumption and investment. Hermalin and Isen (2008) provide a simple example showing how happi-

[7] There is large psychology literature studying the effects of emotions on human behaviors, e.g. Isen (2001), Lyubomirsky, King, and Diener (2005), Boehm and Lyubomirsky (2008). Organizational science has extensive studies about the happiness-productivity relation at the individual level, e.g. Wright and Staw (1999), Wright, Cropanzano, Denney, and Moline (2002).

[8] For a discussion on the implications of happiness studies on policies, see Frank (1997) and Layard (2006).

[9] Notably, rationality assumption is retained rather than abandoned in the model, similar to the rational-addiction literature (e.g., Becker and Murphy, 1988).

ness affects consumption. Suppose utility function takes the form of $U(x_t, u_{t-1})$, where x_t is consumption and u_{t-1} is the mood in the previous time period; then, whether to save *for* rainy days or save *on* rainy days depends on whether happiness raises or lowers the marginal benefit of consumption. Instrumenting individual happiness with regional sunshine, Guven (2007) find that happier people save more. Recent experimental studies also suggest that unhappiness causes excessive consumption (thus, inadequate savings):[10]

> The researchers concluded sadness can trigger a chain of emotions leading to extravagant tendencies. Sadness leads people to become more focused on themselves, causing the person to feel that they and their possessions are worth little. That feeling increases willingness to pay more – presumably to feel better about themselves.

Second, both anecdotal and scientific evidence have illustrated that happiness predicts higher life expectancy (e.g., Deeg and van Zonneveld, 1989; Veenhoven, 2008). Life expectancy affects economic growth: on the one hand, short life expectancy causes riskier behaviors and lowers investment in physical and human capital (Lorentzen, McMillan, and Wacziarg, 2008); on the other hand, longevity increases population of a given country and thus depresses income per capita (Acemoglu and Johnson, 2007).

Third, experiments show that happiness implies generosity (Kirchsteiger, Rigotti, and Rustichini, 2006), and psychologists argue that happiness encourages likability, positive construals of others, sociability, and prosocial behaviors (Lyubomirsky, King, and Diener, 2005). We accordingly conjecture that a society filled with more happiness would have higher levels of trust (social capital),[11] which is argued to affect economic growth (e.g., Helliwell, 1996; Knack and Keefer, 1997; Hall and Jones, 1999; Zak and Knack, 2001).

Section 5 will discuss the respective quantitative implications of these three channels. It is noteworthy that these channels are hypothetical and not exhaustive. It is likely that there are other channels in addition to them, and that they interact or integrate

[10] See "Sadness May Encourage More Extravagance," available at `http://biz.yahoo.com/ap/080208/sadness_spending.html`.

[11] Helliwell (2006) discusses the other direction: the effect of trust on happiness.

and thus do not count as three. This paper is an experiment in nature, typical of the first stage of introducing a new element into established theoretical framework.[12]

3. DATA

The data on cross-country happiness levels are extracted from the World Database of Happiness (2007), compiled by Dr. Ruut Veenhoven and his team. We use two variables to measure happiness: life-satisfaction index and happy-life index, both averaged in the 1990s.[13] They are aggregated from cross-country surveys that ask residents about their levels of subjective happiness.

The survey question regarding life-satisfaction index is that "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 regarding happy-life index is more complex. Three similar wording patterns and corresponding numerical scales are used in the surveys over time. The first one is a three-scale question, asking people "in general, how happy would you say you are?" and the answers range from "very happy (3)" to "not happy (1)." The second one is a four-scale question, asking people "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 one is a five-scale question, asking people "how happy do you feel as you live now?" and the answers range from "very happy (5)" to "very unhappy (1)." Then the researchers conduct Thurstone transformation on the answers to obtain a 1-10 scale numerical measure,[14] with higher value indicating happier life. Since we do not have a thorough knowledge about the subtle differences among these three questions and the transformation, we use life-satisfaction index as our primary measure of happiness, and

[12] For example, the importance of trust (social capital) was first proposed by Putnam (1993), and Helliwell (1996) and Knack and Keefer (1997) empirically documented the positive association between trust and growth. Later, more empirical studies came about (e.g., Temple and Johnson, 1998), and then Zak and Knack (2001) built the first general-equilibrium growth model embedding trust. Afterwards, other theoretical exercises as well as critiques flourished (Durlauf, 2002; Beugelsdijk, de Groot, and van Schaik 2004; Beugelsdijk and Smulders, 2004; among others).

[13] The averages of the 1990s are used here in order to maximize coverage of countries and minimize measurement bias. Hauk and Wacziarg (2007) show that within-group estimator exaggerates measurement bias though reduces heterogenous bias. By using Monte Carlo simulation, they demonstrate that between-group estimator has smaller bias than within-group estimator if measurement problem is significant. Recognizing that there may exist significant measurement problem with happiness, we use the 1990s averages of variables.

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

happy-life index for robustness check when necessary.[15]

Two issues are worth elaborating. First, these indices are subjective measures of happiness. Happiness also has objective measures, which are obtained by recording respondents' physical representation such as brain waves. It should be admitted that the subjective measure is less precise than the objective one; however, there are at least two advantages of adopting the subjective measure: (1) objective measuring is neither convenient nor economical enough to implement at the cross-country level; (2) happiness *per se* has a bearing on social aspects, which provides rationale behind subjective measures (Frey and Stutzer, 2002a, Chapter 1). Being happy or not cannot be measured only with external and fixed rules, because human beings adjust their feelings to certain social contexts.

Second, a person's evaluation of her overall happiness level is relatively stable over time, because the common factors that affect or associate with overall happiness level– such as income, marital status, health, and education–change very slowly over time. People may have a concern over the reliability of subjective measures due to the transient fluctuations in human feelings. Krueger and Schkade (2007), two economists, did an experiment with a random sample of 229 women, finding that overall subjective well-being measures, such as the life-satisfaction index, exhibit sufficiently high correlation over time "to support much of the research that has been undertaken on subjective well-being." Prior to their study, Lyubomirsky and Lepper (1999), two psychologists, reached a similar conclusion with a sample of 2,732 college students. Moreover, researchers find that self-reported happiness is highly correlated with that reported by friends and family members (Sandvik, Diener and Seidlitz, 1993; Costa and McCrae 1988), as well as clinical experts (Goldings, 1954), and associated with the duration of Duchenne smiles (Ekman, Davidson and Friesen, 1990).[16]

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 6.2. Growth rates in GDP per capita and population are annual averages.[17]

[15] Happiness scores in the surveys can be considered either cardinal or ordinal. In an econometric study, Ferrer-i-Carbonell and Frijters (2004) find that assuming cardinality or interpersonal ordinality of the answers makes little difference.

[16] See Konow and Earley (2007) for a comprehensive list of the papers concerning these correlations.

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

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 (2000). The measures of trust (social capital) and suicide rates are also from World Database of Happiness (2007). Trust index is obtained in the same fashion as the happiness indices: respondents report whether they agree 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 (v2.0a, June 2005). Measures of political rights and civil liberties are computed based on Freedom in the World Country Ratings, with a lower value indicating better political rights and civil liberties. Life expectancy at birth is from World Development Indicator Database compiled and maintained by the World Bank. The data of political instability, measured by the percentage of veto players who drop from the government,[18] come from the Database of Political Institutions compiled by the World Bank (2004). Sex imbalance is calculated from 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.

[18] Veto players are defined as "the president and the largest party in the legislature for a presidential system and 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.

4. RESULTS

4.1. Ordinary-Least-Squares (OLS) Results

To investigate the impacts of happiness on economic growth, we estimate the following equation

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

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.

Table 2 reports the OLS estimates. In Column 1, happiness is measured by life-satisfaction index, and its coefficient is positive and statistically significant (1.39, t=3.39). It signifies a quantitatively important correlation: a country with one scale increase in happiness would have approximately 1.4 percentage points higher growth rate. In Column 2, we include a set of control variables that are commonly used in growth regressions, namely, investment ratio, government expenditure share, education level, and openness.[19] The coefficient of happiness rises to 1.62 and remains significant. The coefficient of $\ln GDPPC90_c$ turns out to be negative, supporting the convergence hypothesis in growth theory, which states that poorer countries grow more quickly on average. With the same specification as Columns 1-2, Columns 3-4 use happy-life index as the measure of overall happiness, and lead to the same finding.

Our OLS results could be biased due to endogeneity. As the first attempt to address endogeneity, we include additional variables that may correlate with both growth and happiness in the regression:

1. The effect of *population growth* on economic growth is predicted by the Solow model. Population growth also has a bearing on the age structure of a country. A country with younger citizens is presumably more energetic, aspiring, and optimistic. Younger age structure may boost reproduction, and children are con-

[19] Note that there has been no consensus regarding what regressors should be included in a growth regression (see, for example, Levine and Renelt, 1992; Sala-i-Martin, 1997). In this paper, we are parsimonious in choosing regressors and focus on the most commonly used ones in literature. By doing so, we keep more observations.

sidered as an important source of happiness (see, e.g., Kohler, Behrman, and Skytthe, 2005). A simple regression confirms such association[20]

$$\begin{aligned} \widehat{HAPPINESS} &= -0.35 + 0.41 POPGR + 0.75 \ln GDPPC90 \\ &\qquad\qquad (2.49)^{**} \qquad (5.08)^{**} \end{aligned}$$

with $R^2 = 0.39$ and $F(2, 53) = 13.09$, where $POPGR$ is the average annual growth rate of population in the 1990s.

2. *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).
3. The effect of *political institution* on economic performance has long been established in literature (see, e.g., Acemoglu, Johnson, and Robinson, 2001, 2002; Tavares and Wacziarg, 2001). Meanwhile, political and personal freedom are positively associated with happiness (Frey and Stutzer, 2001a, Chapter 8).
4. *Crimes* dampen investments and thus the growth in a country, and have substantial influences on residents' life quality as well.

As shown in Table 3, our main findings regarding the positive impacts of happiness on economic growth remain significant after all these factors are taken into account. Notably, the coefficient of happiness declines to 1.48 when civil-liberties index is included, suggesting that the coefficient of happiness might capture some correlation between economic growth and civil liberties.

4.2. Instrumental variable: Sex Imbalance

As the second attempt to address endogeneity, we exploit the exogenous variation in sex imbalance to instrument happiness. We define sex imbalance as $(1 - M/F)^2$, where M and F refer to the shares of male and female population, respectively. This formula removes the direction of the imbalance. The rationale behind using sex imbalance as the instrument lies in the importance of partnership and sexual activity in generating happiness.

[20] ** means p-value <0.05.

Marriage is believed to bring happiness (or *utility*, a more "economic" term) to people (Becker, 1981) and empirical studies show that married people are happier than singles (see, e.g., Clark and Oswald, 2002; Stutzer and Frey, 2006; Myers, 1999). Clark and Oswald (2002) find that getting married generates the same amount of happiness as 70,000 pounds of income per year. Furthermore, to identify the causal effect of marriage on happiness, Kohler, Behrman, and Skytthe (2005) utilize a unique dataset covering identical twins in Denmark, and find that people in a partnership report substantially higher levels of happiness than those who are not.

Sexual activity has also been found to strongly boost happiness. Using a sample of 16,000 adult Americans, Blanchflower and Oswald (2004) document several interesting relations between sexual activity and happiness: (i) sexual activity is positively related with happiness; (ii) money does not buy more sex or sexual partners; (iii) the number of sexual partners that maximizes happiness is one; (iv) homosexuality does not have statistically significant effect on happiness.

Sex imbalance causes failures in mating and thus reduces the happiness of the whole society. Failures in mating can be decomposed into "bare branches" effect (Hudson and Den Boer, 2002) and family disruption effect (Messner and Sampson, 1991). "Bare branches" refer to the extra men (or women) who fail to find partners. The more unbalanced the sex ratio is (in either direction), the more people fail in mating and thus are left over as losers in societal competition. Family disruption happens more frequently in the societies with larger sex imbalance, because the individuals of gender in short supply are advantaged in establishing new relationships with those of gender in over supply. Such re-mating causes high divorce rates, single-parent families, and mental health problems of children. Hudson and Den Boer (2002) document several historical cases in which sex imbalance caused serious failures in mating. For instance, the sex ratio was 129:100 in *Huai-pei* of China in the 19th century, and thus 25% of men were unable to marry. Similarly, the sex ratio was 112:100 in medieval Portugal, where not only low-status men, but also some high-status men could not marry. It is thus expected that higher sex imbalance is associated with lower level of happiness in a country. Both Figure 2 and the results shown later confirm this claim.

4.3. Two-Stage-Least-Squares (2SLS) Results

The 2SLS regression results are summarized in Table 4. As shown in Panel B, our instrumental variable, sex imbalance, is negatively and significantly correlated with $HAPPINESS$. In Column 1 of Panel A, the estimated coefficient of $HAPPINESS$ is 1.79, higher than the OLS estimates (1.39), suggesting that a country with a one-standard-deviation increase in happiness has an approximately two percentage points higher growth rate. The sign of logarithm of initial GDP per capita is still negative and significant. This finding is robust to the inclusion of aforementioned control variables (Column 2), as well as alternative measure of $HAPPINESS$ (Columns 3-4).

The validity of our IV rests on two conditions. First, there must be a strong correlation between sex imbalance and happiness, otherwise 2SLS would be inconsistent. Aside from the correlation reported in Panel B, we implement additional statistical tests, including the Anderson canonical correlation test, Cragg-Donald test,[21] and Shea test, to confirm this condition and rule out the weak-instrument concern.

The exclusion condition requires an IV to be orthogonal with the error term; namely, sex imbalance does not affect economic growth through channels other than happiness. This condition is not directly testable if there is only one IV. We carry out four tests to counter-check the exclusion condition.[22] The first test is based on the premise that, if sex imbalance affects economic growth only through happiness, it would have no significant impacts on economic growth conditional on happiness.[23] Column 1 of Table 5 shows that sex imbalance is negatively and significantly associated with growth rate. However, as shown by Column 2, when happiness is included in the regression, sex imbalance no longer has any explanatory power. Not only the coefficient of sex imbalance drops dramatically from -222.51 to -54.21, the t-statistic also falls from -2.22 to -0.54. Columns 3-5 further account for conventional control variables and the alternative measure of happiness, leading to the same conclusion.

The second test is to explicitly control for potential channels other than happiness

[21] The Cragg-Donald F-statistic values for our regressions are far above 10, that is, the critical value pinpointed by Staiger and Stock (1997).

[22] We mainly use life-satisfaction index as the measure of happiness in robustness checks, due to the reasons discussed in Section 3. Results with happy-life index as the measure, which are available upon request, lead to the same conclusion.

[23] See Acemoglu, Johnson, and Robinson (2001) for a similar practice.

through which sex imbalance may affect economic growth. We identify two such channels: crime rate and political instability. Sex imbalance is documented by sociologists to affect crime rates and political stability (Hudson and Den Boer, 2002; Edlund, Li, Yi, and Zhang, 2007; Messner and Sampson, 1991; Messner and Rosenfeld, 1997; among others), which in turn affects economic growth. Regression results are shown in Columns 1-2 of Table 6, and the effect of happiness is consistent with that reported in Table 4 in terms of both magnitude and significance.

The third test is to exclude Asian countries. It is reported that, in some Asian countries, son preference causes parents to commit infanticide, gender-specific abortion and concealment of births (e.g., Hull, 1990; Qian, 2008), which may render sex imbalance endogenous. We exclude Asian countries in the estimation, and the results are reported in Column 3 of Table 6. The previous results do not change.

The fourth test is to include the control variables that may correlate with both economic growth and sex imbalance. As mentioned earlier, the effect of population growth on economic growth is predicted by the Solow model. Low birth rate may bias sex ratio upward (Chu, 2001) or downward (Yoon, 2006). Institutional quality is another potential driver of both growth and sex imbalance. Discrimination against or preference over a certain gender is presumably associated with a distempered society. In Columns 1-4 of Table 7, we control for the growth rate of population, income inequality, civil-liberties index, and political-rights index, respectively, and find that our main findings do not change.

4.4. Robustness Checks

In addition to the counter-checks in the last subsection, we carry out three group of robustness checks. When looking at Figure 2, one might have the concern that the correlation between happiness and sex imbalance is driven by some influential outliers, because the data pattern looks skewed to the right. Following Nunn and Puga (2007), we first adopt two transformations of the sex-imbalance measure, the logarithm transformation and the zero skewness Box-Cox power transformation, to check whether our results still hold.

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. Our main results are robust to this transformation. Looking at Figure 4, one may worry that the logarithm transformation of sex imbalance is now a little left-skewed. We then adopt the zero skewness Box-Cox power transformation instead. Figure 5 shows the correlation between happiness and transformed sex imbalance. Clearly, the relationship between happiness and transformed sex imbalance is less sensitive to outliers. Column 2 reports the corresponding 2SLS estimates, which confirm the positive causal effects on growth rate.

Next, we use an alternative IV, suicide rate, to repeat the analysis.[24] The results are reported in Columns 3-4 of Table 8, with Panel A for the second stage, Panel B for the first stage, and Panel C for various tests, respectively. Suicide rate is negatively and significantly correlated with happiness. Meanwhile, the Anderson canonical correlation LR statistic and the Cragg-Donald Chi-square statistic show that this IV is relevant, and the Shea test for excluded instrument and the Cragg-Donald F-statistic rule out the concern for weak instrument. Panel A shows that our main results still holds.[25] Finally, we repeat our analysis using two sub-samples, the western- and eastern-hemisphere countries.[26] Results are reported in Table 9. It is clear that our main results remain robust to using these two sub-samples.

5. CHANNEL INVESTIGATION

We mention in Section 2 that happiness is likely to affect economic growth through investment, life expectancy, and trust (social capital). This section aims to quantitatively evaluate their relative importance. Our econometric methodology, the three-stage-least-squares (3SLS) estimation, follows Tavares and Wacziarg (2001), Wacziarg (2001), and Lorentzen, McMillan, and Wacziarg (2008). Compared to 2SLS, 3SLS improves in efficiency by taking advantage of cross-equation error correlation. It also

[24] This alternative IV exercise is used only as a robustness check. We do not deny the fact that we have to take caution when interpreting its results, because suicide data are not as reliable as sex ratio due to under-reporting in many countries.

[25] One may argue that economic recession causes mental misery, and thus leads to suicides. Arguably, suicides caused by economic reasons are more likely to result from lower income level instead of long-run growth rate, whereas initial income level is already included in the regression.

[26] Since only two countries are located in the southern hemisphere in our dataset, it is infeasible to carry out the analysis using the sub-samples of northern- and southern-hemisphere countries.

allows us to compute a single covariance matrix for all the estimates, facilitating complex inferences on the functions of the parameters that belong to different equations.

We use life satisfaction index as the measure of happiness and instrument it by sex imbalance. The regression results are reported in Table 10. 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, supporting the prediction of the Solow model and Lorentzen, McMillan, and Wacziarg (2008), respectively.[27]

We then combine the estimates in Columns 2-4 with those in Column 1 to calculate the total effect of happiness on economic growth. Column 3 of Table 11 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).[28] The total effect is 1.83, implying that a one-scale increase in happiness raises growth rate by 1.83 percentage points. Recalling that the total effect of happiness was estimated to be 2.01 (Column 2, Table 4), slightly higher than 1.83, we conjecture that there are other unknown channels through which happiness works. Although the three investigated channels are not exhaustive, investment ratio and life expectancy, which account for 37% and 63% of the estimated effect, are quantitatively predominant.

6. CONCLUSION

Happiness is an important factor in determining residents' behaviors. To date, most effort in happiness economics has been devoted to understanding the determinants of happiness and the impacts of happiness on human behaviors at the micro level. This

[27] Lorentzen, McMillan, and Wacziarg (2008) find that earlier death discourages human capital investment by reducing the long-term return of human capital (p.88).

[28] t-statistics following the coefficients 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" (Wacziarg, 2001). Specifically, suppose the growth equation is

$$\hat{Y} = a + bX + cZ + \varepsilon$$

and the channel equation is

$$\hat{X} = d + eM + fN + \varepsilon.$$

To compute the standard error of the effect of M on $\hat{Y}$, we use the following formula:

$$Var(be) = e^2\sigma_b^2 + b^2\sigma_e^2 + 2be\sigma_{be}$$

where σ_b, σ_e, and σ_{be} are b's and e's standard deviations and their correlation coefficient, respectively (Newman, 2002).

paper takes a different approach by studying the impact of happiness on economic growth. Having found a robust correlation between happiness and economic growth, we instrument happiness by sex imbalance, which impedes normal mating and thus negatively affects happiness. The 2SLS results show that countries with happier citizens grow faster. Other things being equal, a one-standard-deviation higher happiness could generate two percentage points higher growth rate. The results are robust to several different specifications. Finally, to understand how happiness affects economic growth, we implement a channel investigation by using 3SLS estimation, and find that happiness encourages investment and extends individuals' longevity, both of which promote economic growth.

The results also shed some lights on policy issues. Given the positive impacts of happiness on economic growth, policy makers may reevaluate some policies that potentially boost happiness of residents, such as welfare program, universal medical care, and some labor regulations. The primary functions of such programs are not making people happier, whereas they can causes an enhancement in the happiness level of residents as a side product. Consequently, the economic gains from these programs are prone to be underestimated. Meanwhile, as a general implication regarding economic development, it is advisable to address the mental misery of populace in low-income countries in addition to treating their economic difficulties. Not only poverty itself, but also the absence of hope and mental misery associated with poverty is worth attention. Happiness helps to guide people in struggling out of poverty by appropriate consumption and investment, as well as prolonging their life spans.

References

Acemoglu, Daron and Johnson, Simon. "Disease and Development: The Effect of Life Expectancy on Economic Growth." *Journal of Political Economy*, 2007, 115, pp. 925-985.

Acemoglu, Daron; Johnson, Simon and Robinson, James, A. "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review*, 2001, (5), pp. 1369-1401.

____. "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution." *Quarterly Journal of Economics*, 2002, 117(4), pp. 1231-1294.

Alesina, Alberto; Di Tella, Rafael and MacCulloch, Robert. "Inequality and Happiness: Are Europeans and Americans Different?" *Journal of Public Economics*, 2004, *88*(9-10), pp. 2009-2042.

Barro, Robert J. "Inequality and Growth in a Panel of Countries." *Journal of Economic Growth*, 2000, 5(1), pp. 5-32.

Beck, Thorsten; Clarke, George; Groff, Alberto; Keefer, Philip and Walsh, Patrick. "New Tools in Comparative Political Economy: The Database of Political Institutions." *World Bank Economic Review*, 2001, *15*(1), pp. 165-176.

Becker, Gary. *A Treatise on the Family*. Cambridge, MA: Harvard University Press, 1981.

Becker, Gary S. and Murphy, Kevin M. "A Theory of Rational Addiction*." Journal of Political Economy*, 1988, *96*(4), pp. 675-700.

Beugelsdijk, Sjoerd; de Groot, Henri L. F. and van Schaik, Anton B. T. M. "Trust and Economic Growth: A Robustness Analysis." *Oxford Economic Papers*, 2004, *56*(1), pp. 118-34.

Beugelsdijk, Sjoerd and Smulders, Sjak "Social Capital and Economic Growth," Tilburg University, 2004.

Blanchflower, David, G. and Oswald, Andrew, J . "Money, Sex and Happiness: An Empirical Study." *Scandinavian Journal of Economics*, 2004, *106*(3), pp. 393-415.

Boehm, Julia K. and Lyubomirsky, Sonja. "Does Happiness Promote Career Success?" *Journal of Career Assessment*, 2008, *16*(1), pp. 101-16.

Booth, Alison L. and van Ours, Jan C. "Job Satisfaction and Family Happiness: The Part-Time Work Puzzle." *Economic Journal*, 2008, *118*(526), pp. F77-F99.

Bosman, Ronald and van Winden, Frans. "Emotional Hazard in a Power-to-Take Experiment." *Economic Journal*, 2002, *112*(476), pp. 147-69.

Chu, JunHong. 2001. "Prenatal Sex Determination and Sex-selective Abortion in Rural Central China." *Population and Development Review*, 27(2), pp. 259–281.

Clark, Andrew E. and Oswald, Andrew J. "Unhappiness and Unemployment." *Economic Journal*, 1994, *104*(424), pp. 648-59.

____. "A Simple Statistical Method for Measuring How Life Events Affect Happiness." *International Journal of Epidemiology*, 2002, *31*(6), pp. 1139-44.

Costa, Paul T; McCrae, Robert R. "Personality in Adulthood: A Six-Year Longitudinal Study of Self-Reports and Spouse Ratings on the Neo Personality Inventory." *Journal of Personality and Social Psychology*, 1988, *54*(5), pp. 853-63.

Davis, Devra Lee; Webster, Pamela; Stainthorpe, Hillary; Chilton, Janice; Jones, Lovell, and Doi, Rikuo. "Declines in Sex Ratio at Birth and Fetal Deaths in Japan, and in U.S. Whites but Not African Americans." *Environmental Health Perspectives*, 2007, *115*(6), pp. 941-946.

Deeg , Dorly J.H. and van Zonneveld, Robert J. "Does Happiness Lengthen Life?" Veenhoven Ruut (eds.) *How Harmful Is Happiness.* Universitaire Pers Rotterdam, Netherlands, 1989.

Di, Tella, Rafael; MacCulloch, Robert, J. "Some Uses of Happiness Data in Economics." *Journal of Economic Perspectives*, 2006, *20*(1), pp. 25–46.

Di, Tella, Rafael; MacCulloch, Robert, J. and Oswald, Andrew, J. "Preferences over Inflation and Unemployment: Evidence from Surveys of Happiness." *American Economic Review*, 2001, *91*(1), pp. 335-41.

____. "The Macroeconomics of Happiness." *Review of Economics and Statistics*, 2003, *85*(4), pp. 809-27.

Diener, Ed. "Subjective Well-Being." *Psychological Bulletin*, 1984, *95*(3), pp. 542-75.

Dixon, Huw D. "Controversy: Economics and Happiness: editorial Note." *Economic Journal*, 1997, *107*(445), pp. 1812-14.

Durlauf, Steven, N. "On the Empirics of Social Capital." *Economic Journal*, 2002, *112*(483), pp. 459-79.

Easterlin, Richard A. "Does Economic Growth Improve the Human Lot? Some Empirical Evidence." In David, P. A. and Reder, Melvin W. (eds.) *Nations and Households in Economic Growth: Essays in Honour of Moses Abramovitz.* New York and London: Academic Press, 1974.

____. "Will Raising the Incomes of All Increase the Happiness of All?" *Journal of Economic Behavior & Organization*, 1995, *27*(1), pp. 35-47.

____. "Income and Happiness: Towards an Unified Theory." *Economic Journal*, 2001, *111*(473), pp. 465-84.
Easterly, William. "Life During Growth." *Journal of Economic Growth*, 1999, *4*(3), pp. 239-76.
Edlund, Lena; Li, Hongbin; Yi, Junjian and Zhang, Junsen. "Sex Ratios and Crime: Evidence from China's One-Child Policy." Institute for the Study of Labor Working Paper 3214, 2007.
Ekman, Paul; Davidson, Richard J. and Friesen, Wallace V. "The Duchenne Smile: Emotional Expression and Brain Physiology: II." *Journal of Personality and Social Psychology*, 1990, *58*(2), pp. 342-53.
Elster, Jon. "Emotions and Economic Theory." *Journal of Economic Literature*, 1998, *36*(1), pp. 47-74.
Ferrer-i-Carbonell, Ada and Frijters, Paul. "How Important is Methodology for the estimates of the determinants of Happiness?" *Economic Journal*, 2004, *114*(497), pp.641-659.
Frank, Robert H. "The Frame of Reference as a Public Good." *Economic Journal*, 1997, *107*(445), pp. 1832-1847.
Frey, Bruno, S. and Stutzer, Alois. *Happiness and Economics*. Princeton, New Jersey: Princeton University Press, 2002a.
____. "What Can Economists Learn from Happiness Research?" *Journal of Economic Literature*, 2002b, *40*(2), pp. 402-35.
____. "Testing Theories of Happiness," Institute for Empirical Research in Economics, 2003.
Frijters Paul; Haisken-DeNew, John, P. and Shields, Michael, A. "Money Does Matter! Evidence from Increasing Real Income and Life Satisfaction in East Germany Following Reunification." *American Economic Review*, 2004, *94*(3), pp. 730-40.
Gardner, Jonathan and Oswald, Andrew J. "Money and Mental Wellbeing: A Longitudinal Study of Medium-Sized Lottery Wins." *Journal of Health Economics*, 2007, *26*(1), pp. 49-60.
Goldings, Herbert Jeremy. "On the Avowal and Projection of Happiness." *Journal of Personality*, 1954, *23*(1), pp. 30-47.
Guven, Cahit. "Reversing the Question. Does Happiness Affect Individual Economic Behavior? Evidence from Surveys from the Netherlands and Germany." 2007.
Gray, Ronald H.; Simpson, Joe L.; Bitto, Adenike C.; Queenan, John T.; Li, Chuanjun; Kambic, Robert T.; Perez, Alfredo; Mena, Patricio; Barbato, Michele; Stevenson, Wilma and Jennings, Victoria. "Sex Ratio Associated with Timing of Insemination and Length of the Follicular Phase in Planned and Unplanned Pregnancies during Use of Natural Family Planning." *Human Reproduction*, 1998, *13*(5), pp.1397–1400.
Hall, Robert E. and Jones, Charles I. "Why Do Some Countries Produce So Much More Output per Worker than Others?" *Quarterly Journal of Economics*, 1999, *114*(1), pp. 83-116.
Hauk, William R. and Wacziarg, Romain. "A Monte Carlo Study of Growth." Working paper, 2007.
Helliwell, John, F. "How's Life? Combining Individual and National Variables to Explain Subjective Well-Being." National Bureau of Economic Research Working Paper 9065, 1996.
____. "Economic Growth and Social Capital in Asia" National Bureau of Economic Research Working Paper 5470, 1996.
____. "Well-Being, Social Capital and Public Policy: What's New?" *Economic Journal*, 2006, *116* (510), pp.C34-C45
Hermalin, Benjamin and Isen, Alice. "A Model of the Effect of Affect on Economic Decision Making." *Quantitative Marketing and Economics*, 2008, *6*(1), pp. 17-40.
Hudson, Valerie M. and Den Boer, Andrea. "A Surplus of Men, a Deficit of Peace: Security and Sex Ratios in Asia's Largest States." *International Security*, 2002, *26*(4), pp. 5-39.
Hull, Terence H. "Recent Trends in Sex Ratios at Birth in China." *Population and Development Review*, 1990, *16*(1), pp. 63-83.
Isen, Alice M. "An Influence of Positive Affect on Decision Making in Complex Situations: Theoretical Issues with Practical Implications." *Journal of Consumer Psychology*, 2001, *11*(2), pp. 75-85.
James, William H. "Evidence that mammalian sex ratios at birth are partially controlled by parental hormone levels around the time of conception." *Journal of Endocrinology*, 2008, *198*, pp. 3-15.
Kahneman, Daniel. "Maps of Bounded Rationality: Psychology for Behavioral Economics." *American Economic Review*, 2003, *93*(5), pp. 1449-75.
Kenny, Charles. "Does Growth Cause Happiness, or Does Happiness Cause Growth?" *Kyklos*, 1999, *52*(1), pp. 3-25.
Kirchsteiger, Georg; Rigotti, Luca and Rustichini, Aldo. "Your Morals Might Be Your Moods." *Journal of Economic Behavior & Organization*, 2006, *59*(2), pp. 155-72.
Knack, Stephen and Keefer, Philip. "Does Social Capital Have an Economic Payoff? A Cross-Country Investigation." *Quarterly Journal of Economics*, 1997, *112*(4), pp. 1251-88.
Kohler, Hans-Peter; Behrman, Jere R and Skytthe, Axel. "Partner + Children = Happiness? The Effects of Partnerships and Fertility on Well-Being." *Population and Development Review*, 2005, *31*, pp. 407-45.
Konow, James and Earley, Joseph. "The Hedonistic Paradox: Is Homo Economicus Happier?" University Library of

Munich, Germany, 2007.
Krueger, Alan, B. and Schkade, David, A . "The Reliability of Subjective Well-Being Measures." National Bureau of Economic Research Working Paper 13027, 2007.
Layard, Richard. "Happiness and Public Policy: a Challenge to the Profession." *Economic Journal*, 2006, *116*(510), pp. C24-C33.
Levine, Ross & Renelt, David. "A Sensitivity Analysis of Cross-Country Growth Regressions." *American Economic Review*, 1992, *82*(4), pp. 942-63.
Loewenstein, George. "Emotions in Economic Theory and Economic Behavior." *American Economic Review*, 2000, *90*(2), pp. 426-32.
Lorentzen, Peter; McMillan, John; Wacziarg, Romain. "Death and Development." *Journal of Economic Growth*, 2008, *13*(2), pp. 81-124.
Lyubomirsky, Sonja and Lepper, Heidi S. "A Measure of Subjective Happiness: Preliminary Reliability and Construct Validation." *Social Indicators Research*, 1999, *46*(2), pp. 137-55.
Lyubomirsky, Sonja; King, Laura and Diener, Ed. "The Benefits of Frequent Positive Affect: Does Happiness Lead to Success?" *Psychological Bulletin*, 2005, *131*(6), pp. 803-55.
Myers, D.G. "Close Relationship and Quality of Life." In Kahneman, D., Diener, E., Schwarz, N. (eds.) *Well-being: the Foundations of Hedonic Psychology*, Russell Sage Foundation, New York, 1999, pp. 374-391.
Messner, Steven F. and Rosenfeld, Richard. "Political Restraint of the Market and Levels of Criminal Homicide: A Cross-National Application of Institutional-Anomie Theory." *Social Forces*, 1997, *75*(4), pp. 1393-416.
Messner, Steven F. and Sampson, Robert J. "The Sex Ratio, Family Disruption, and Rates of Violent Crime: The Paradox of Demographic Structure." *Social Forces*, 1991, *69*(3), pp. 693-713.
Morawetz, David; Atia, Ety; Bin-Nun, Gabi; Felous, Lazaros; Gariplerden, Yuda; Harris, Ella; Soustiel, Sami; Tombros, George and Zarfaty, Yossi. "Income Distribution and Self-Rated Happiness: Some Empirical Evidence." *Economic Journal*, 1977, *87*(347), pp. 511-522.
Newman, Ken B. Delta Method for Variance Estimation. 2002.
Ng, Yew-Kwang. "A Case for Happiness, Cardinalism, and Interpersonal Comparability." *Economic Journal*, 1997. *107*(445), pp. 1848-1858.
____. "The East-Asian Happiness Gap: Speculating on Causes and Implications." *Pacific Economic Review*, 2002, *7*(1), pp. 51-63.
Nunn, Nathan and Diego Puga. "Ruggedness: The blessing of bad geography in Africa." Working paper, 2007.
Oswald, Andrew J. "Happiness and Economic Performance." *Economic Journal*, 1997, *107*(445), pp. 1815-31.
Oswald, Andrew J. and Powdthavee, Nattavudh. "Daughters and Leftwing Voting." *Review of Economics and Statistics,* forthcoming.
Qian, Nancy. "Missing Women and the Price of Tea in China: The Effect of Sex-Specific Earnings on Sex Imbalance." *Quarterly Journal of Economics*, 2008, 123(3), pp. 1251-85.
Putnam, Robert D. (with Robert Leonardi and Raffaella Y. Nanetti). *Making Democracy Work*. Princeton University Press, Princeton, MA. 1993.
Sala-i-Martin, Xavier X. "I Just Ran Four Million Regressions."National Bureau of Economic Research Working Paper 6252, 1997.
Sandvik, Ed; Diener, Ed and Seidlitz, Larry. "Subjective Well-Being: The Convergence and Stability of Self-Report and Non-Self-Report Measures." *Journal of Personality*, 1993, *61*(3), pp. 317-42.
Sieff, Daniela, F. "Explaining Biased Sex Ratios in Human Populations: A Critique of Recent Studies." *Current Anthropology*, 1990, *31*(1), pp. 25-48.
Staiger, D. and Stock, J.H. "Instrumental Variables Regression with Weak Instruments." *Econometrica*, 1997, *65*, pp. 557-586.
Stutzer, Alois and Frey, Bruno S. "Does Marriage Make People Happy, or Do Happy People Get Married? " *Journal of Socio-Economics*, 2006, *35*(2), pp. 326-47.
Tavares, Jose and Wacziarg, Romain. "How Democracy Affects Growth." *European Economic Review*, 2001, *45*(8), pp. 1341-78.
Temple, Jonathan and Johnson, Paul, A. "Social Capability and Economic Growth." *Quarterly Journal of Economics*, 1998, *113*(3), pp. 965-90.
Tremblay, Marc; Vezina, Helene; Houde, Louis and Chung, Robert. "Demographic Determinants of the Sex Ratio at Birth in the Saguenay Population, Quebec." *Population*, 2003, *58*(3), pp. 383-394.
van Praag, Bernard M. S. and Baarsma, Barbara E. "Using Happiness Surveys to Value Intangibles: The Case of Airport Noise." *Economic Journal*, 2005, *115* (500), 224–246.
Veenhoven, Ruut. *World Database of Happiness*, Erasmus University Rotterdam.

Available at: http://worlddatabaseofhappiness.eur.nl Assessed at: 2007-3-6.

____. "Healthy Happiness: Effects of Happiness on Physical Health and the Consequences for Preventive Health Care." *Journal of Happiness Studies*, 2008, *9*(3): 449–469.

Voitchovsky, Sarah. "Does the Profile of Income Inequality Matter for Economic Growth?" *Journal of Economic Growth*, 2005, *10*(3), pp. 273-96.

Wacziarg, Romain. "Measuring the Dynamic Gains from Trade." *World Bank Economic Review*, 2001, *15*(3), pp. 393-429.

Wright, Thomas A. and Staw, Barry M. "Affect and Favorable Work Outcomes: Two Longitudinal Tests of the Happy-Productive Worker Thesis." *Journal of Organizational Behavior*, 1999, *20*(1), pp. 1-23.

Wright, Thomas A; Cropanzano Russell; Denney, Philip J. and Moline, Gary L. "When a Happy Worker Is a Productive Worker: A Preliminary Examination of Three Models." *Canadian Journal of Behavioural Science*, 2002, *34*(3), pp. 146-50.

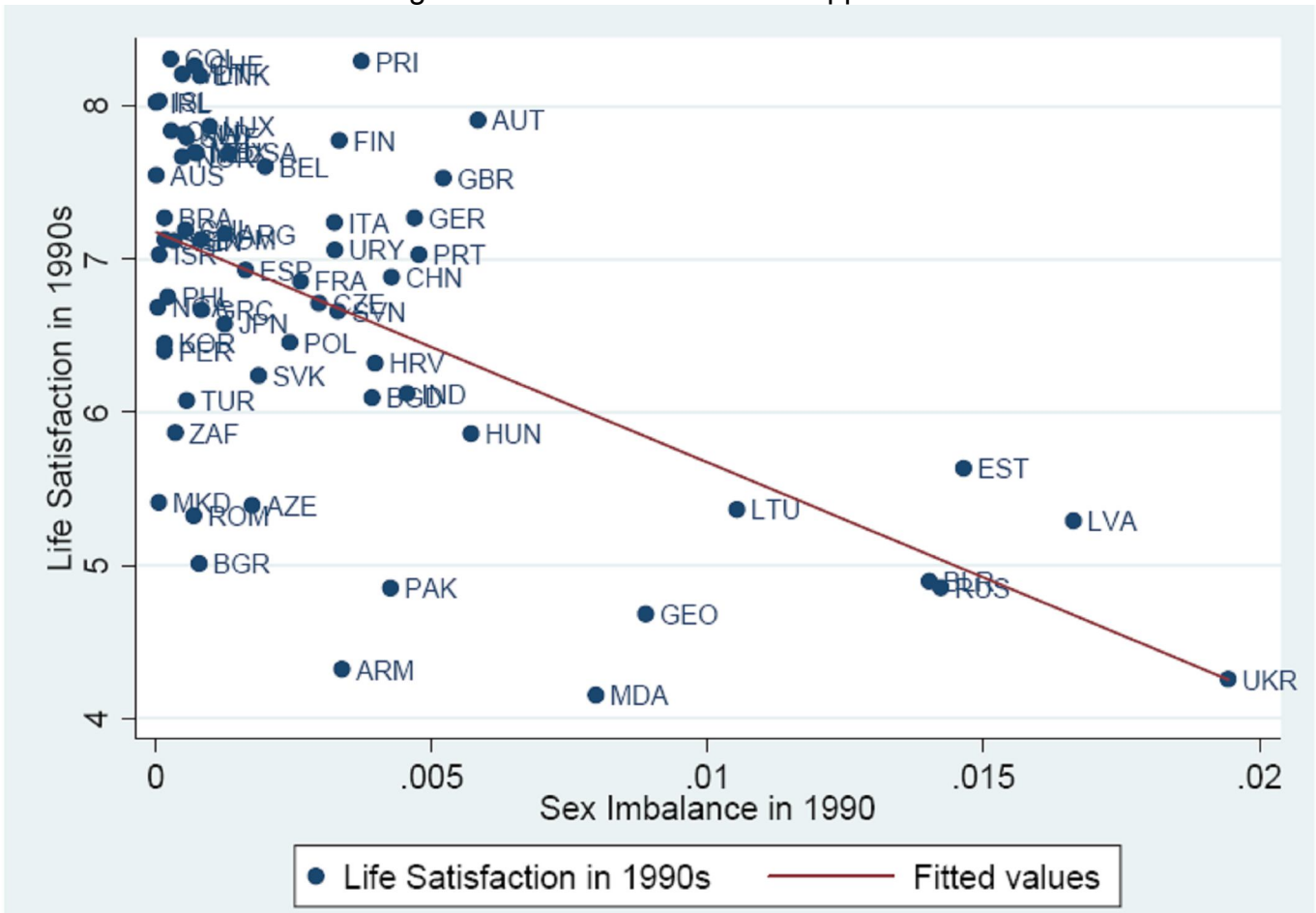
Yoon, Yong J. "Gender Imbalance: The Male/Female Sex Ratio Determination." *Journal of Bioeconomics*, 2006, *8*(3), pp. 253-268.

Zak, Paul J. and Knack, Stephen. "Trust and Growth." *Economic Journal*, 2001, *111*(470), pp. 295-321.

Figure 1: Happiness and Economic Growth

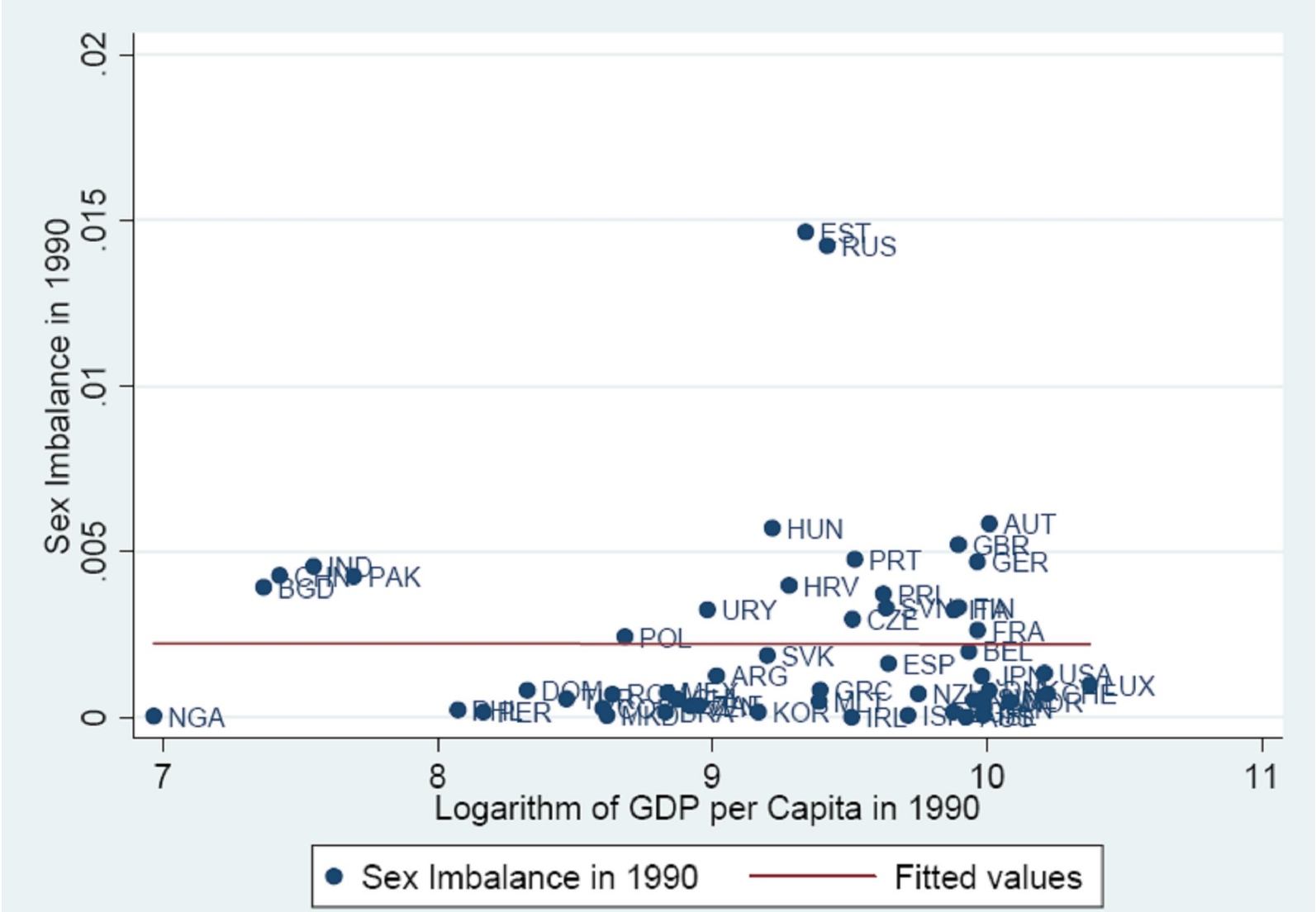
Notes: The data of happiness measured by life-satisfaction index are from the World Database of Happiness (2007). Growth rates in GDP per capita are calculated based on the data from Penn World Table 6.2.

Figure 2: Sex Imbalance and Happiness



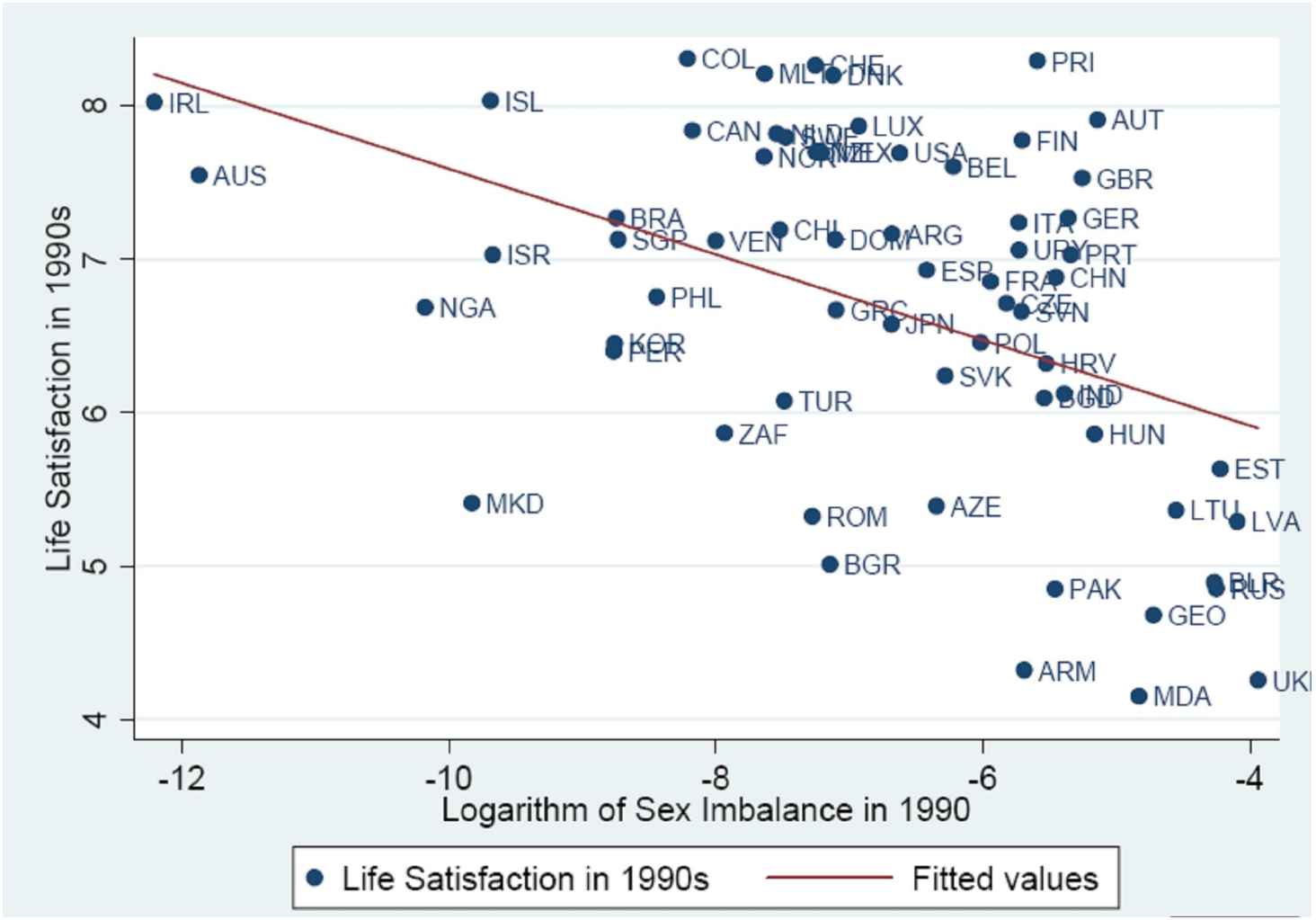
Notes: Sex imbalance in 1990 is calculated based on the medium-variant projections of "mid-year de facto female population" and "mid-year de facto male population" compiled by United Nations (2005). See Section 4 for the calculation details. The data of happiness measured by life-satisfaction index are from the World Database of Happiness (2007).

Figure 3: Sex Imbalance and Initial Economic Condition



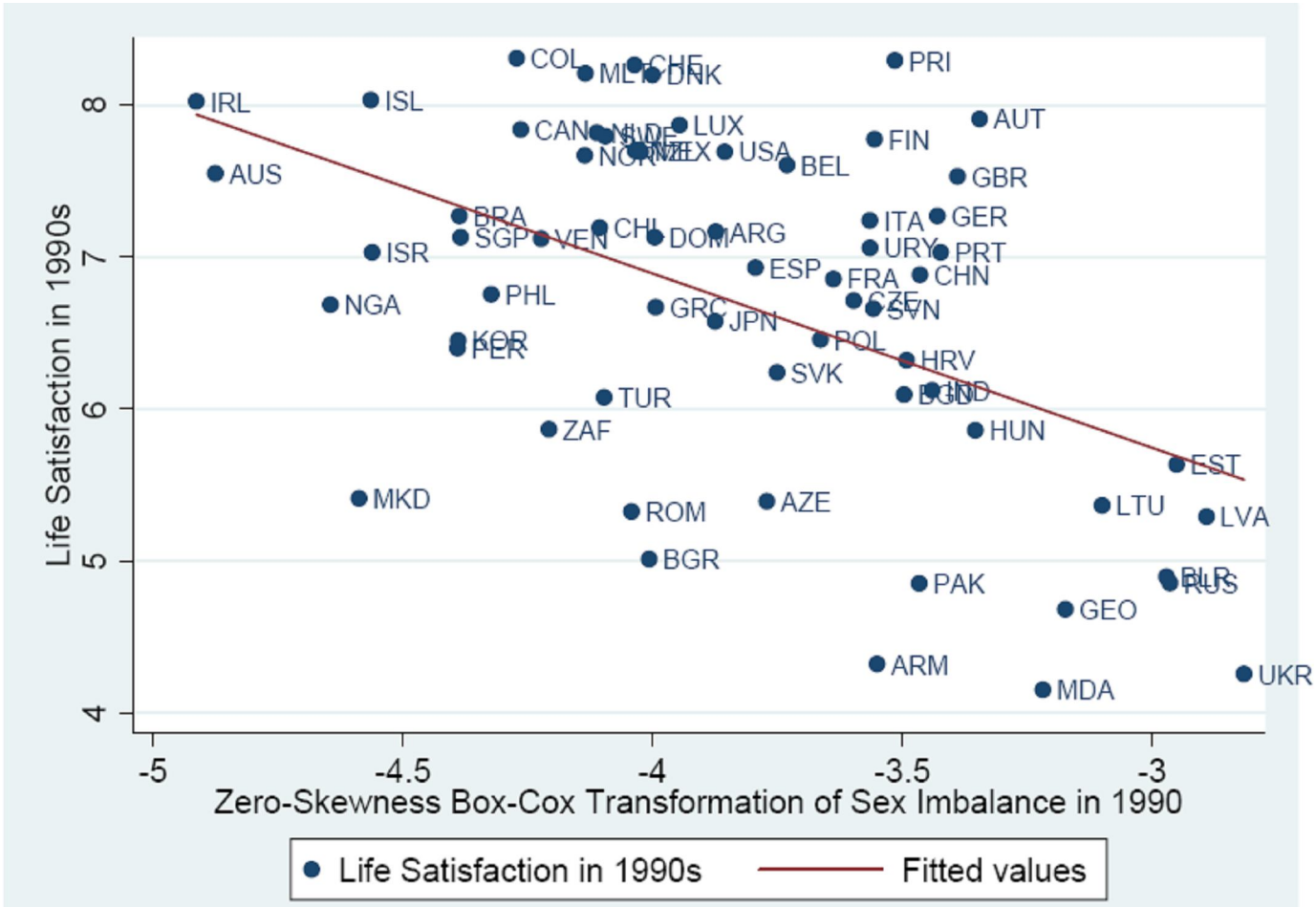
Notes: Sex imbalance in 1990 is calculated based on the medium-variant projections of “mid-year de facto female population” and “mid-year de facto male population” compiled by United Nations (2005). See Section 4 for the calculation details. The data on GDP per capita are from Penn World Table 6.2.

Figure 4: Logarithm of Sex Imbalance and Happiness



Notes: Sex imbalance in 1990 is calculated based on the medium-variant projections of "mid-year de facto female population" and "mid-year de facto male population" compiled by United Nations (2005). See Section 4 for the calculation details. The data of happiness measured by life-satisfaction index are from the World Database of Happiness (2007).

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



Notes: Sex imbalance in 1990 is calculated based on the medium-variant projections of "mid-year de facto female population" and "mid-year de facto male population" compiled by United Nations (2005). See Section 4 for the calculation details. The data of happiness measured by life-satisfaction index are from the World Database of Happiness (2007).

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	-7.20	9.44
Life-satisfaction Index	65	6.69	1.12	4.15	8.31
Happy-life Index	65	6.83	0.81	5.06	8.10
Sex Imbalance	64	0.00	0.00	0.00	0.02
Logarithm of GDP per Capita in 1990	56	9.25	0.81	6.97	10.37
Investment Ratio	56	19.10	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	12.00
Openness	56	70.04	57.22	13.97	358.11
Population Growth	65	0.81	0.92	-1.3	3.18
Gini Coefficient	40	35.60	11.02	20.00	64.70
Civil Liberties	64	2.66	1.39	1.00	6.80
Political Rights	64	2.26	1.48	1.00	7.00
Crime Rate	58	6.43	11.90	0.06	66.58
Political Instability	64	0.16	0.11	0.00	0.43
Suicide Rate	50	13.69	9.60	0.90	38.70
Life Expectancy	64	72.07	5.99	47.46	79.73
Trust	65	1.58	0.28	1.08	2.30

Table 2: OLS Estimates
(Dependent Variable: Average Annual Growth Rate of GDP per Capita in the 1990s)

	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)
Trade		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 at 10%, 5%, and 1%, respectively.

Table 3: OLS Estimates, Robustness Check
(Dependent Variable: Average Annual Growth Rate of GDP per Capita in the 1990s)

	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	4.80	5.08
p-value for F-statistic	0.00	0.00	0.00	0.00	0.00

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

Table 4: 2SLS Estimates

	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 heteroskadasticity, are reported in parentheses. *, **, *** represent significance levels at 10%, 5%, and 1%, respectively.

Table 5: 2SLS Estimates, Counter Check I

	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	0.10	0.27	0.49	0.20	0.38
F-statistic	2.80	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 heteroskadasticity, are reported in parentheses. *, **, *** represent significance levels at 10%, 5%, and 1%, respectively.

Table 6: 2SLS Estimates, Counter Checks II and III

	1	2	3
Happiness Measure	Life Satisfaction		
Sample	Whole Sample		Without Asian
Panel A: Second-stage estimates. Dependent variable: Growth rate			
Happiness Index	2.18***	2.05***	1.96***
	(5.44)	(3.95)	(5.17)
Logarithm of GDP per Capita in 1990	-2.50***	-2.62***	-1.45**
	(-4.44)	(-4.45)	(-2.04)
Investment Rate	0.13***	0.15***	0.01
	(2.67)	(3.147)	(0.20)
Government Expenditure Share	0.07	0.06	0.00
	(1.49)	(1.35)	(0.11)
Education	-0.09	0.06	0.11
	(-0.86)	(0.43)	(0.75)
Openness	0.00	0.00	0.00
	(0.32)	(0.94)	(0.75)
Crime Rate	-0.03		
	(-1.17)		
Political Instability		-0.65	
		(-0.30)	
Constant	6.69*	7.08*	-0.40
	(1.74)	(1.94)	(-0.10)
Panel B: First-stage estimates. Dependent variable: Happiness			
Sex Imbalance	-134.67***	-138.08***	-139.07***
	(-5.02)	(-5.56)	(-5.41)
Panel C: Test statistics			
Anderson Canonical Correlation LR Statistic	[16.79]***	[19.95]***	[20.44]***
Cragg-Donald Chi-Statistic	[20.18]***	[24.42]***	[26.33]***
Shea Test of Excluded Instruments	[25.22]***	[30.92]***	[29.31]***
Cragg-Donald F-Statistic	16.74	20.59	21.94
Number of observation	47	51	42

Notes: t-values, adjusted for heteroskadasticity, are reported in parentheses. *, **, *** represent significance levels at 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).

Table 7: 2SLS Estimates, Counter Check IV

	1	2	3	4
Happiness Measure	Life Satisfaction			
Panel A: Second-stage estimates. Dependent variable: Growth rate				
Happiness	2.12***	2.37***	1.90***	1.96***
	(2.88)	(4.23)	(3.45)	(3.85)
Logarithm of GDP per Capita in 1990	-2.69***	-3.27***	-2.90***	-2.97***
	(-3.49)	(-4.66)	(-4.44)	(-4.08)
Investment Rate	0.14***	0.13**	0.15***	0.15***
	(3.47)	(2.38)	(3.34)	(3.47)
Government Expenditure Share	0.05	0.01	0.05	0.05
	(1.35)	(0.20)	(1.25)	(1.22)
Education	0.06	0.08	0.03	0.05
	(0.41)	(0.48)	(0.20)	(0.38)
Openness	0.00	0.01**	0.01	0.01
	(1.34)	(1.96)	(1.34)	(1.37)
Population Growth	-0.11			
	(-0.28)			
Gini Index		-0.03		
		(-0.76)		
Civil Liberties			-0.29	
			(-0.85)	
Political Rights				-0.28
				(-0.87)
Constant	7.40**	12.86*	11.44*	11.27**
	(1.97)	(1.65)	(1.83)	(1.96)
Panel B: First-stage estimates. Dependent variable: Happiness				
Sex Imbalance	-107.91***	-119.93***	-117.87***	-127.63***
	(-2.75)	(-4.83)	(-4.27)	(-5.32)
Panel C: Test statistics				
Anderson Canonical Correlation LR Statistic	[9.32]***	[12.30]***	[15.18]***	[16.90]***
Cragg-Donald Chi-Statistic	[10.21]***	[14.91]***	[17.68]***	[20.03]***
Shea Test of Excluded Instruments	[7.58]***	[23.30]***	[29.74]***	[28.29]***
Cragg-Donald F-Statistic	8.64	11.30	14.91	16.89
Number of observation	52	33	51	51

Notes: t-values, adjusted for heteroskadasticity, are reported in parentheses. *, **, *** represent significance levels at 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).

Table 8: 2SLS Estimates, Robustness Checks I and II

Happiness Measure	1 Life Satisfaction	2 Life Satisfaction	3 Life Satisfaction	4 Happy Life
Panel A: Second-stage estimates. Dependent variable: Growth rate				
Happiness	2.05**	1.84**	2.38***	3.30***
	(2.22)	(3.85)	(3.65)	(2.76)
Logarithm of GDP per Capita in 1990	-2.61***	-2.45***	-2.80***	-3.06***
	(-3.10)	(-3.22)	(-3.70)	(-2.69)
Investment Rate	0.14***	0.14***	0.15***	0.13**
	(3.39)	(3.33)	(3.47)	(2.36)
Government Expenditure Share	0.06	0.05	0.07	0.12*
	(1.36)	(1.27)	(1.40)	(1.70)
Education	0.07	0.06	0.21	0.32
	(0.49)	(0.44)	(1.23)	(1.20)
Openness	0.00	0.00	0.01**	0.01
	(1.36)	(1.42)	(2.18)	(0.91)
Constant	6.96*	7.14*	4.82	-0.25
	(1.87)	(1.85)	(1.00)	(-0.04)
Panel B: First-stage estimates. Dependent variable: Happiness				
Logarithm of Sex Imbalance	-0.16**			
	(-2.65)			
Zero-Skewness Box-Cox Transformation of Sex Imbalance		-0.70***		
		(-2.79)		
Suicide rate			-0.05***	-0.03**
			(-3.23)	(-2.10)
Panel C: Test statistics				
Anderson Canonical Correlation LR Statistic	[7.90]***	[10.02]***	[10.41]***	[7.11]***
Cragg-Donald Chi-Statistic	[8.53]***	[11.05]***	[13.15]***	[7.16]***
Shea Test of Excluded Instruments	[7.00]**	[7.80]***	[15.50]***	[4.43]**
Cragg-Donald F-Statistic	7.38	9.56	12.85	6.43
Number of observation	52	52	41	41

Notes: t-values, adjusted for heteroskadasticity, are reported in parentheses. *, **, *** represent significance levels at 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).

Table 9: 2SLS Estimates, Robustness Check III

	1	2
Happiness Measure	Life Satisfaction	
Sub-Sample	Eastern	Western
Panel A: Second-stage estimates. Dependent variable: Growth rate		
Happiness	1.63**	2.41***
	(2.09)	(3.02)
Logarithm of GDP per Capita in 1990	-2.32***	-2.44**
	(-3.19)	(-2.50)
Investment Rate	0.18***	0.13
	(3.33)	(1.22)
Government Expenditure Share	0.07*	0.14
	(1.80)	(1.04)
Education	-0.12	0.38
	(-0.90)	(1.38)
Openness	0.00	0.02
	(0.30)	(1.29)
Constant	7.62**	-1.26
	(1.97)	(-0.23)
Panel B: First-stage estimates. Dependent variable: Happiness		
Sex Imbalance	-70.77*	-149.66***
	(-1.81)	(-7.48)
Panel C: Test statistics		
Anderson Canonical Correlation LR Statistic	[2.82]*	[15.48]***
Cragg-Donald Chi-Statistic	[2.95]*	[23.92]***
Shea Test of Excluded Instruments	[3.29]*	[55.91]**
Cragg-Donald F-Statistic	2.32	15.11
Number of observation	33	19

Notes: t-values, adjusted for heteroskadasticity, are reported in parentheses. *, **, *** represent significance levels at 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).

Table 10: 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	0.30	0.36	0.76	0.25
Chi2-statistic	23.00	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 at 10%, 5%, and 1%, respectively.

Table 11: 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 10. 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.