

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

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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, Sex Imbalance, 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, subsequently leading to a rise of productivity;¹ whereas sadness causes apathy and indolence, which in turn decrease individual performance.² Does the happiness of residents have impacts on the economic growth of a country?³

Higher income has been believed to boost happiness for long,⁴ 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

¹A recent study by Oswald, Proto, and Sgroi (2008) uses a randomized natural experiment and finds that a rise in happiness leads to a greater productivity.

²Diener (1984) provides a review of psychology literature regarding the effects of subjective mental well-being on human behaviors.

³In 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).

⁴A 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, Haikens-DeNew, and Shields (2004), Gardner and Oswald (2007), and Oswald (1997). A recent study by Stevenson and Wolfers (2008) find that the positive impacts of income on happiness are robust to various cross-country and within-country data sets spanning many decades.

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 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 three 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 explicitly examine several conceivable potential channels other than happiness through which sex imbalance may affect growth rate. Third, we investigate whether our results are biased due to the inclusion of some Asian countries, where gender-specific infanticide, abortion and birth mis-reporting are reported and may consequently distort sex imbalance (e.g., Hull, 1990), and some former or current communist countries, where

the collapse of the Soviet system induces the alcoholism and consequently distort sex imbalance (e.g., Harding, 2008). 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.⁵ 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,⁶ 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 not correlated 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:⁷ (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,

⁵ As for the use of the exogeneity in sex, see Oswald and Powdthavee (forthcoming).

⁶ 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).

⁷ 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).

1974, 1995, 2001; Easterly, 1999; Frey and Stutzer, 2002a, 2002b; Frijters, Haikens-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; Loewenstein, 2000).⁸ 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.⁹

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

⁸There 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).

⁹For a discussion on the implications of happiness studies on policies, see Frank (1997) and Layard (2006).

and Isen, 2008).¹⁰

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 happiness 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):¹¹

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),¹² which is argued to affect economic

¹⁰Notably, rationality assumption is retained rather than abandoned in the model, similar to the rational-addiction literature (e.g., Becker and Murphy, 1988).

¹¹See “Sadness May Encourage More Extravagance,” available at http://biz.yahoo.com/ap/080208/sadness_spending.html.

¹²Helliwell (2006) discusses the other direction: the effect of trust on happiness.

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 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.¹³

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.¹⁴ 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

¹³For 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).

¹⁴The 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.

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,¹⁵ 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 happy-life index for robustness check when necessary.¹⁶

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

¹⁵Detailed descriptions of the variables are available at http://worlddatabaseofhappiness.eur.nl/hap_quer/hqi_fp.htm.

¹⁶Happiness 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.

clinical experts (Goldings, 1954), and associated with the duration of Duchenne smiles (Ekman, Davidson, and Friesen, 1990).¹⁷

GDP per capita, population, investment ratio, the share of government expenditure in GDP, and openness (measured by $(\text{import} + \text{export})/\text{GDP}$) are extracted from Penn World Table 6.2. Growth rates in GDP per capita and population are annual averages.¹⁸ 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 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,¹⁹ 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.

¹⁷See Konow and Earley (2007) for a comprehensive list of the papers concerning these correlations.

¹⁸Appendix 1 provides the details on data sources and the construction of variables.

¹⁹Veto 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

$$GR_c = \alpha + \beta \cdot HAPPINESS_c + \delta \cdot \ln GDP_{PC90}_c + X'_c \gamma + \varepsilon_c \quad (1)$$

where GR_c is the growth rate of GDP per capita in country c , $HAPPINESS_c$ is overall happiness in country c , $\ln GDP_{PC90}_c$ 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.²⁰ The coefficient of happiness rises to 1.62 and remains significant. The coefficient of $\ln GDP_{PC90}_c$ 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-

²⁰Note 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 Skyttthe, 2005). A simple regression confirms such association²¹

$$\widehat{HAPPINESS} = -0.35 + 0.41POPGR + 0.75 \ln GDP_{PC90} \\ (2.49)^{**} \quad (5.08)^{**}$$

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.

^{21**} 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,²² 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 three tests to counter-check the exclusion condition.²³ 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.²⁴ 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 investigate whether sex imbalance affects economic

²²The Cragg-Donald F-statistic values for our regressions are far above 10, that is, the critical value pinpointed by Staiger and Stock (1997).

²³We 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.

²⁴See Acemoglu, Johnson, and Robinson (2002) for a similar practice.

growth through some conceivable potential channels other than happiness. For example, 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. Meanwhile, the effect of population growth on economic growth is predicted by the Solow model and 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 as discrimination against or preference over a certain gender is presumably associated with a distempered society. In Table 6, we control for six potential channels, that is, crime rate, political instability, population growth, Gini index, civil liberties, and political rights. It is clear that the effect of happiness is consistent with that reported in Table 4 in terms of both magnitude and significance.

The third test is to examine whether our results are biased to the inclusion of some particular countries. For example, 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. Meanwhile, it is reported that the collapse of the Soviet system in some former or current communist countries leads to a rise of alcoholism, which in turn distorts sex imbalance in these countries (e.g., Harding, 2008). In other words, there could be some unobserved country characteristics that may correlate both sex imbalance and economic growth. To rule out this concern, we include a dummy for Asian countries in Column 1 of Table 7, and a dummy for former or current communist countries in Column 2 of Table 7.²⁵ The previous results 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,

²⁵Another way to examine whether our results are biased due to the inclusion of these particular countries is to exclude these countries in the regression sample. This approach is, however, econometrically inefficient as there is a significant drop in the sample size. Nonetheless, the regression results are similar and available upon request.

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.²⁶ 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.²⁷

Finally, we repeat our analysis using two sub-samples, the western- and eastern-hemisphere countries.²⁸ Results are reported in Table 9. It is clear that our main results remain robust to using these two sub-samples.

²⁶This 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.

²⁷One 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.

²⁸Since 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.

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 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.²⁹

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).³⁰ 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

²⁹Lorentzen, McMillan, and Wacziarg (2008) find that earlier death discourages human capital investment by reducing the long-term return of human capital (p.88).

³⁰t-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).

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 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 cause 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.

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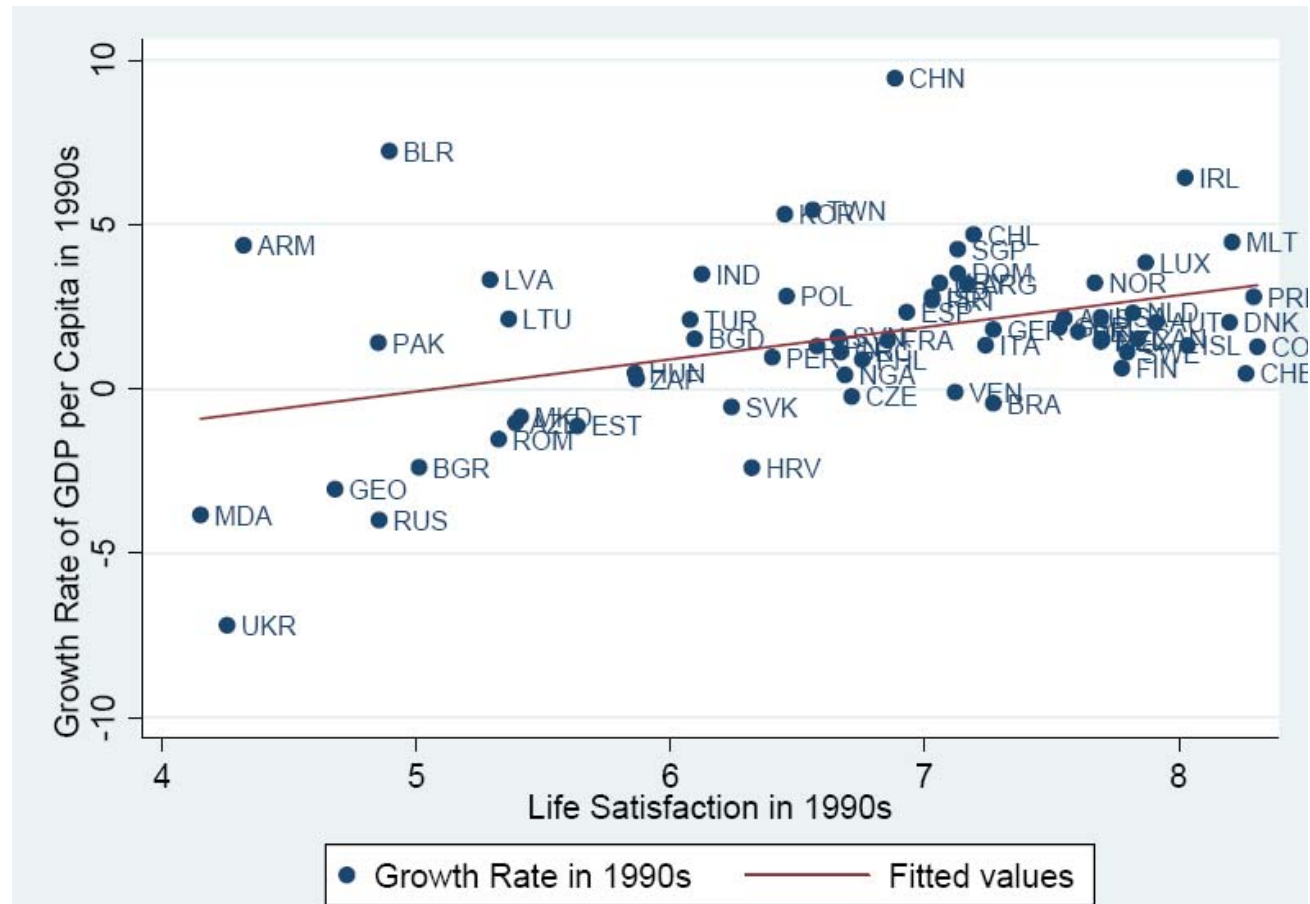
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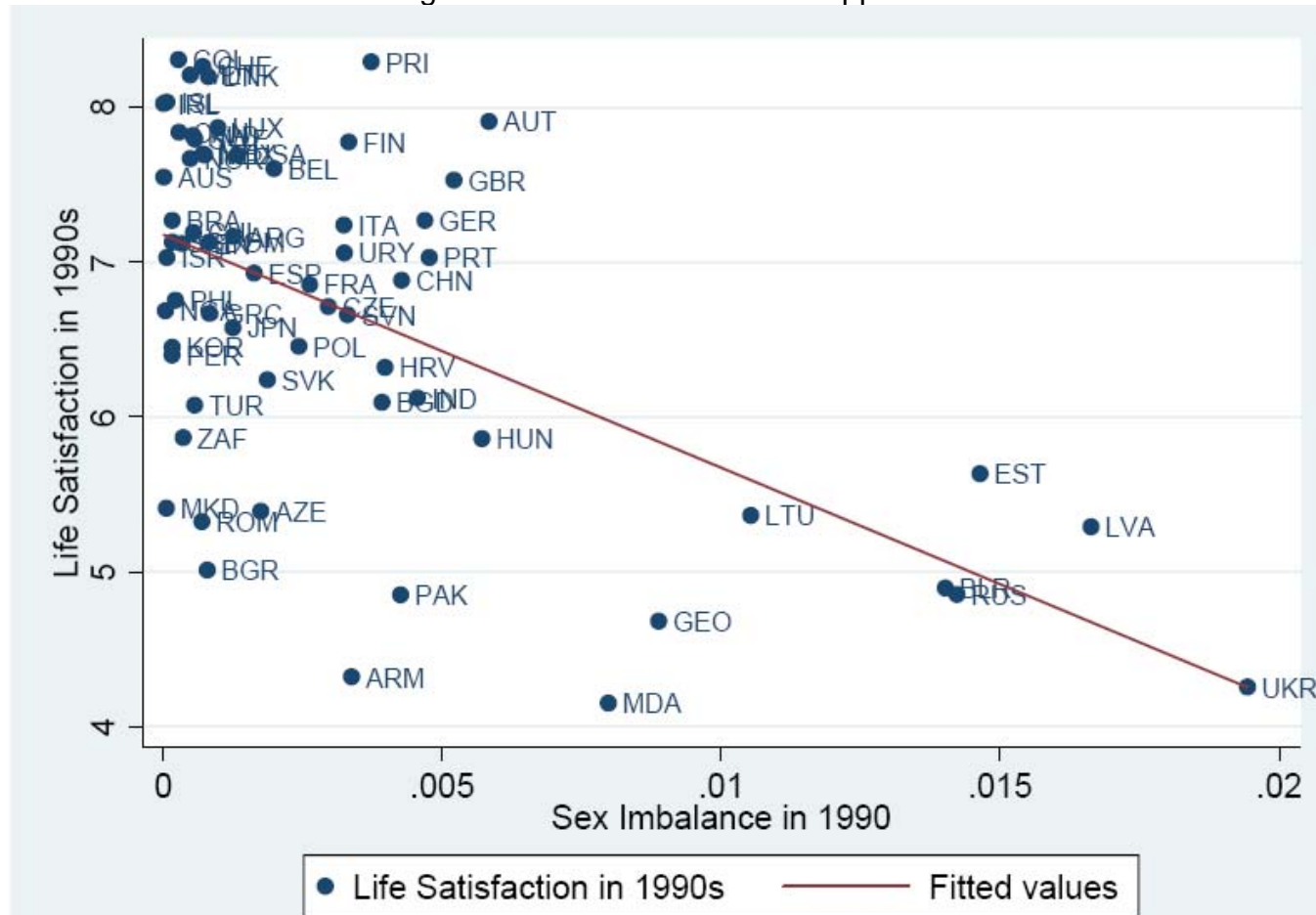
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Figure 1: Happiness and Economic Growth



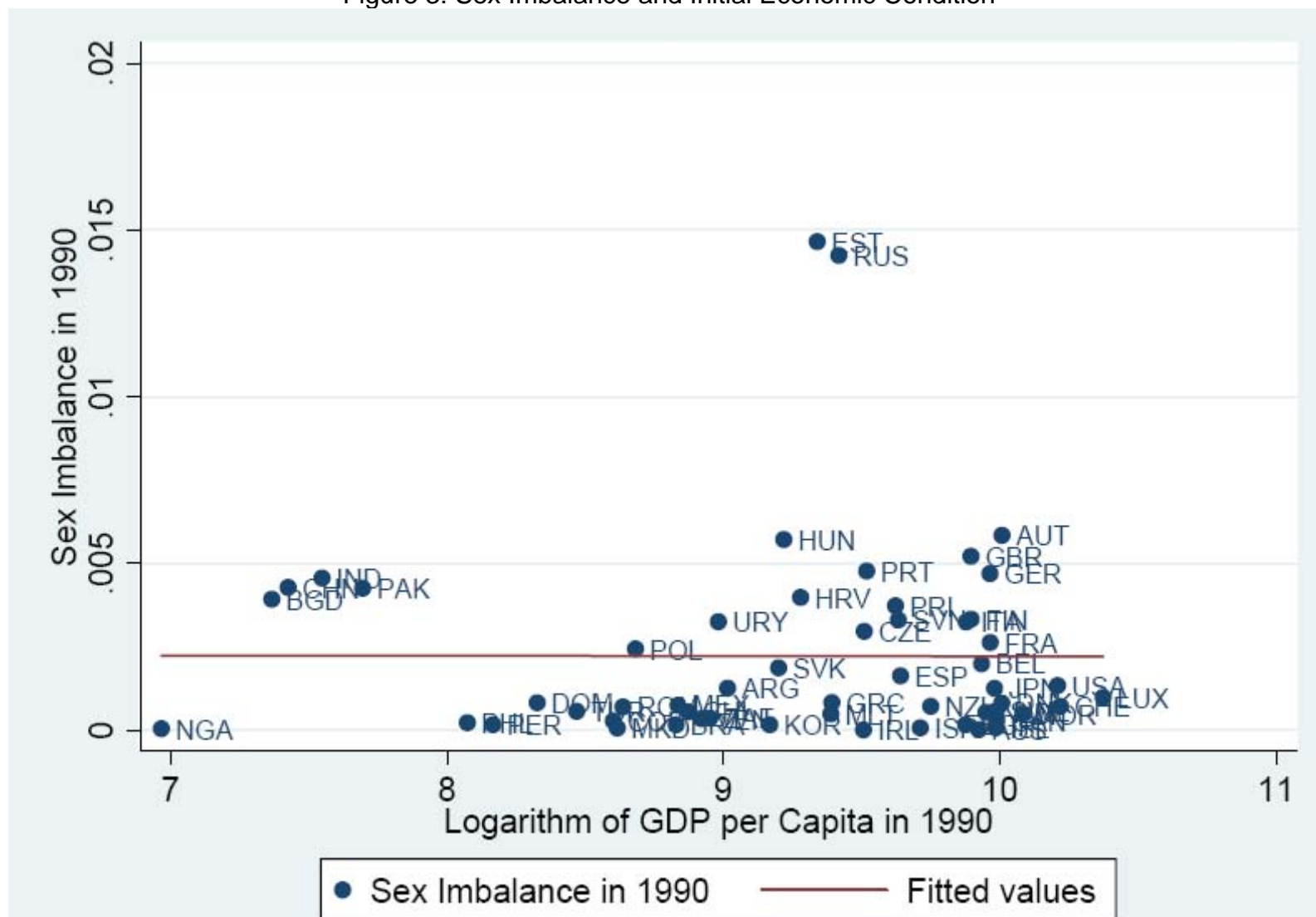
Notes: The data of happiness measured by life-satisfaction index are from the World Database of Happiness (2007). Growth rates in GDP per capita are calculated based on the data from Penn World Table 6.2.

Figure 2: Sex Imbalance and Happiness



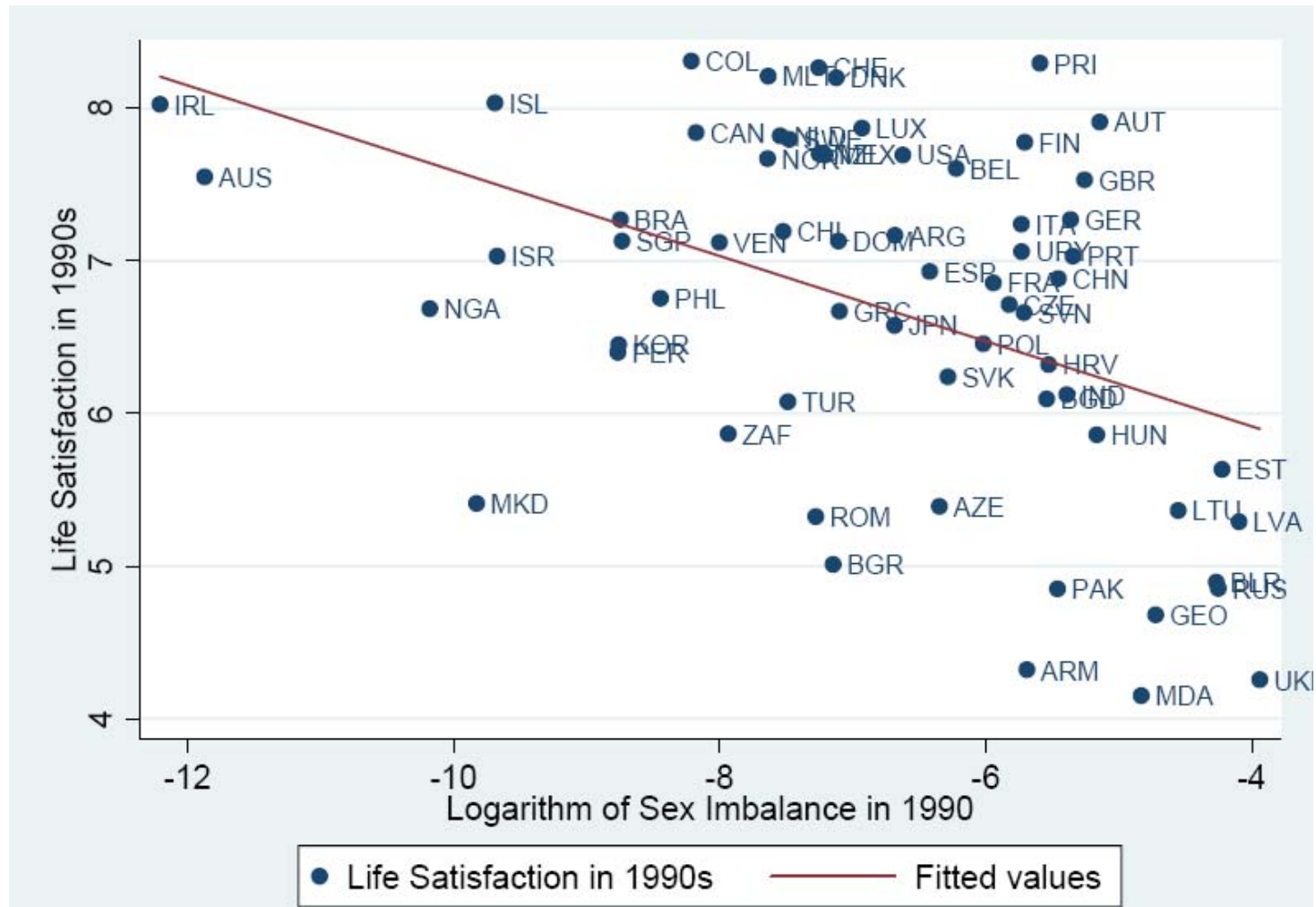
Notes: Sex imbalance in 1990 is calculated based on the medium-variant projections of “mid-year de facto female population” and “mid-year de facto male population” compiled by United Nations (2005). See Section 4 for the calculation details. The data of happiness measured by life-satisfaction index are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

Figure 3: Sex Imbalance and Initial Economic Condition



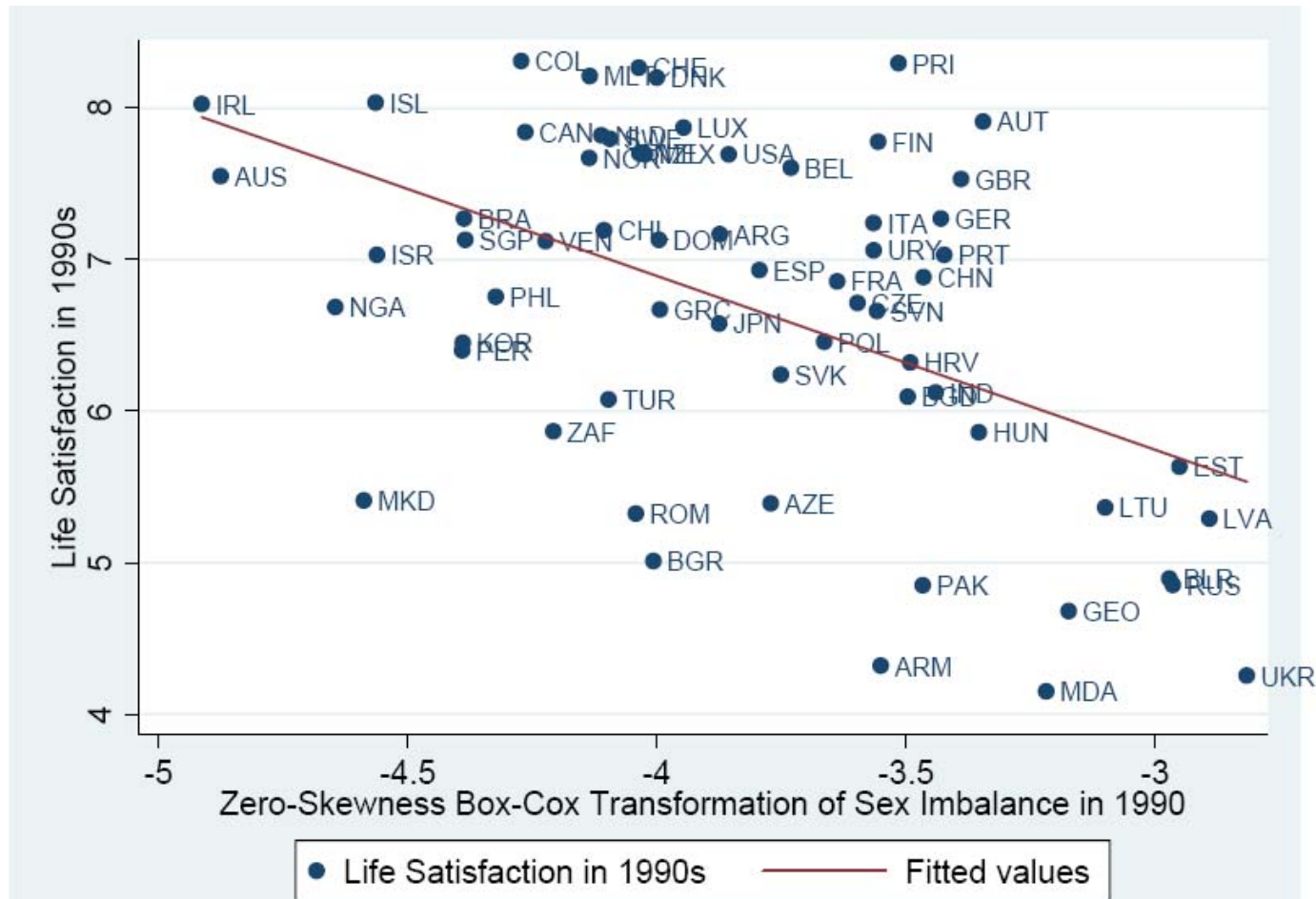
Notes: Sex imbalance in 1990 is calculated based on the medium-variant projections of “mid-year de facto female population” and “mid-year de facto male population” compiled by United Nations (2005). See Section 4 for the calculation details. The data of happiness measured by life-satisfaction index are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

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*** (3.39)	1.62*** (3.81)	1.44*** (3.11)	1.64*** (3.03)
Initial Logarithm of GDP per Capita	-0.92 (-1.63)	-2.26*** (-3.28)	-0.53 (-1.09)	-1.90** (-2.31)
Investment Ratio		0.13*** (2.69)		0.11** (2.08)
Government Expenditure Share		0.04 (0.96)		0.05 (1.04)
Education		0.05 (0.34)		0.16 (0.94)
Trade		0.01 (1.51)		0.01 (1.40)
Constant	0.63 (0.17)	7.43* (1.75)	-3.42 (-0.81)	3.12 (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 heteroskedasticity, 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)

Happiness Measure	1	2	3	4	5
	Life Satisfaction				
Happiness	1.60*** (3.51)	1.79*** (3.13)	1.48*** (3.15)	1.58*** (3.60)	1.76*** (5.02)
Logarithm of GDP per Capita in 1990	-2.23*** (-2.92)	-3.06*** (-3.31)	-2.63*** (-3.56)	-2.50*** (-3.12)	-2.19*** (-3.47)
Investment Rate	0.13** (2.57)	0.10 (1.54)	0.14*** (2.70)	0.14** (2.63)	0.13** (2.30)
Government Expenditure Share	0.04 (0.99)	-0.01 (-0.09)	0.04 (0.83)	0.04 (0.86)	0.06 (1.30)
Education	0.06 (0.37)	-0.03 (-0.16)	0.00 (0.01)	0.04 (0.24)	-0.11 (-0.96)
Trade	0.01 (1.41)	0.01** (2.12)	0.01 (1.50)	0.01 (1.35)	0.00 (0.31)
Population Growth	0.06 (0.19)				
Gini Index		-0.06 (-1.10)			
Civil Liberties			-0.34 (-0.80)		
Political Rights					
Crime Rate				-0.18 (-0.44)	-0.03 (-1.23)
Constant	7.18 (1.51)	18.06 (1.64)	12.67* (1.94)	10.19 (1.57)	6.95 (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 heteroskedasticity, are reported in parentheses. *, **, *** represent significance levels at 10%, 5%, and 1%, respectively.

Table 4: 2SLS Estimates

Happiness Measure	1	2	3	4
	Life Satisfaction		Happy Life	
Panel A: Second-stage estimates. Dependent variable: growth rate				
Happiness	1.79*** (3.18)	2.01*** (3.55)	2.07*** (3.08)	2.53*** (3.58)
Logarithm of GDP per Capita in 1990	-1.16** (-2.38)	-2.58*** (-4.09)	-0.70 (-1.63)	-2.39** (-2.99)
Investment Rate		0.14*** (3.57)		0.12*** (2.65)
Government Expenditure Share		0.06 (1.37)		0.08 (1.62)
Education		0.07 (0.48)		0.26 (1.33)
Openness		0.00 (1.38)		0.01 (1.29)
Constant	-0.10 (-0.02)	6.99* (1.88)	-6.31 (-1.10)	0.02 (0.00)
Panel B: First-stage estimates. Dependent variable: Happiness				
Sex Imbalance	-124.08*** (-4.40)	-125.24*** (-4.94)	-107.51*** (-4.27)	-99.66*** (-3.69)
Logarithm of GDP per Capita in 1990	0.55*** (4.86)	0.69** (2.64)	0.26*** (3.05)	0.47** (2.25)
Investment Rate		-0.02 (-1.01)		-0.01 (-0.64)
Government Expenditure Share		-0.01 (-0.46)		-0.01 (-0.99)
Education		-0.01 (-0.26)		-0.09 '(-1.64)
Openness		0.00 (0.40)		0.00 '(0.16)
Constant	2.15* (1.95)	1.55 (0.82)	4.86*** (6.04)	3.99** (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 at 10%, 5%, and 1%, respectively.

Table 5: 2SLS Estimates, Counter Check I

Happiness Measure	1	2	3	4	5
		Life Satisfaction		Happy Life	
Happiness		1.36*** (2.80)	1.62*** (3.70)	1.18*** (2.30)	1.32*** (2.39)
Sex Imbalance	-222.51** (-2.22)	-54.21 (-0.54)	-49.67 (-0.55)	-95.78 (-0.95)	-120.68 (-1.26)
Logarithm of GDP per Capita in 1990	-0.16 (-0.34)	-0.91 (-1.44)	-2.31*** (-3.22)	-0.47 (-0.90)	-1.82** (-2.07)
Investment Rate			0.13*** (2.76)		0.11** (2.04)
Government Expenditure Share			0.05 (1.18)		0.06 (1.15)
Education			0.06 (0.41)		0.15 (0.85)
Openness			0.01 (1.34)		0.01 (1.32)
Constant	3.76 (0.84)	0.84 (0.24)	7.61* (1.82)	-1.98 (-0.49)	4.85 (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 heteroskedasticity, are reported in parentheses. *, **, *** represent significance levels at 10%, 5%, and 1%, respectively.

Table 6: 2SLS Estimates, Counter Check II

Happiness Measure	1	2	3	4	5	6
Life Satisfaction						
Panel A: Second-stage estimates. Dependent variable: Growth rate						
Happiness	2.18*** (5.44)	2.05*** (3.95)	2.12*** (2.88)	2.37*** (4.23)	1.90*** (3.45)	1.96*** (3.85)
Logarithm of GDP per Capita in 1990	-2.50*** (-4.44)	-2.62*** (-4.45)	-2.69*** (-3.49)	-3.27*** (-4.66)	-2.90*** (-4.44)	-2.97*** (-4.08)
Investment Rate	0.13*** (2.67)	0.15*** (3.147)	0.14*** (3.47)	0.13** (2.38)	0.15*** (3.34)	0.15*** (3.47)
Government Expenditure Share	0.07 (1.49)	0.06 (1.35)	0.05 (1.35)	0.01 (0.20)	0.05 (1.25)	0.05 (1.22)
Education	-0.09 (-0.86)	0.06 (0.43)	0.06 (0.41)	0.08 (0.48)	0.03 (0.20)	0.05 (0.38)
Openness	0.00 (0.32)	0.00 (0.94)	0.00 (1.34)	0.01** (1.96)	0.01 (1.34)	0.01 (1.37)
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)
Constant	6.69* (1.74)	7.08* (1.94)	7.40** (1.97)	12.86* (1.65)	11.44* (1.83)	11.27** (1.96)
Panel B: First-stage estimates. Dependent variable: Happiness						
Sex Imbalance	-134.67***	-138.08***	-107.91***	-119.93***	-117.87***	-127.63***

	(-5.02)	(-5.56)	(-2.75)	(-4.83)	(-4.27)	(-5.32)
Panel C: Test statistics						
Anderson Canonical Correlation LR Statistic	[16.79]***	[19.95]***	[9.32]***	[12.30]***	[15.18]***	[16.90]***
Cragg-Donald Chi-Statistic	[20.18]***	[24.42]***	[10.21]***	[14.91]***	[17.68]***	[20.03]***
Shea Test of Excluded Instruments	[25.22]***	[30.92]***	[7.58]***	[23.30]***	[29.74]***	[28.29]***
Cragg-Donald F-Statistic	16.74	20.59	8.64	11.30	14.91	16.89
Number of observation	47	51	52	33	51	51

Notes: t-values, adjusted for heteroskedasticity, 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 Checks III

Happiness Measure	1	2
	Life Satisfaction	
Panel A: Second-stage estimates. Dependent variable: Growth rate		
Happiness Index	1.92*** (3.84)	1.94** (2.05)
Logarithm of GDP per Capita in 1990	-2.00*** (-3.29)	-2.59*** (-4.13)
Investment Rate	0.10* (1.96)	0.14*** (3.46)
Government Expenditure Share	0.05 (1.24)	0.06 (1.48)
Education	0.09 (0.63)	0.09 (0.42)
Openness	0.00 (1.29)	0.01 (1.14)
Asian Countries Dummy	1.31* (1.83)	
Former or Current Communist Countries Dummy		-0.18 (-0.14)
Constant	2.89 (0.73)	7.49 (1.36)
Panel B: First-stage estimates. Dependent variable: Happiness		
Sex Imbalance	-128.49*** (-4.55)	-83.50*** (-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 heteroskedasticity, 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** (2.22)	1.84** (3.85)	2.38*** (3.65)	3.30*** (2.76)
Logarithm of GDP per Capita in 1990	-2.61*** (-3.10)	-2.45*** (-3.22)	-2.80*** (-3.70)	-3.06*** (-2.69)
Investment Rate	0.14*** (3.39)	0.14*** (3.33)	0.15*** (3.47)	0.13** (2.36)
Government Expenditure Share	0.06 (1.36)	0.05 (1.27)	0.07 (1.40)	0.12* (1.70)
Education	0.07 (0.49)	0.06 (0.44)	0.21 (1.23)	0.32 (1.20)
Openness	0.00 (1.36)	0.00 (1.42)	0.01** (2.18)	0.01 (0.91)
Constant	6.96* (1.87)	7.14* (1.85)	4.82 (1.00)	-0.25 (-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*** (-3.23)	-0.03** (-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 heteroskedasticity, 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

Happiness Measure Sample	1	2
	Life Satisfaction Eastern	Western
Panel A: Second-stage estimates. Dependent variable: Growth rate		
Happiness	1.63** (2.09)	2.41*** (3.02)
Logarithm of GDP per Capita in 1990	-2.32*** (-3.19)	-2.44** (-2.50)
Investment Rate	0.18*** (3.33)	0.13 (1.22)
Government Expenditure Share	0.07* (1.80)	0.14 (1.04)
Education	-0.12 (-0.90)	0.38 (1.38)
Openness	0.00 (0.30)	0.02 (1.29)
Constant	7.62** (1.97)	-1.26 (-0.23)
Panel B: First-stage estimates. Dependent variable: Happiness		
Sex Imbalance	-70.77* (-1.81)	-149.66*** (-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 heteroskedasticity, 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

Dependent Variable	1	2	3 Life Expectancy	4
Happiness		3.57** (2.02)	2.57*** (2.97)	-0.02 (-0.28)
Logarithm of GDP per Capita in 1990	-3.92*** (-3.28)	2.25 (1.27)	4.50*** (6.64)	0.05 (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 (0.75)		0.06*** (3.01)
Openness		0.06*** (4.07)		
Population		1.74*** (3.76)		
Political Instability		-2.98 (-0.45)	2.01 (0.62)	
Constant	2.08 (0.41)	-49.22*** (-3.60)	12.94** (2.44)	0.85* (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 (2.87)	3.57 (2.02)	0.68 (1.63)
Trust	-0.26 (-0.15)	-0.02 (-0.28)	0.01 (0.13)
Life Expectancy	0.45 (2.27)	2.57 (2.97)	1.15 (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.

Appendix 1: Data

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 6.2*, 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 $(\text{import}+\text{export})/\text{GDP}$. 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 on March 6, 2007. 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*, V 2.0a, June 2005. 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-t>
[he-Operations-of-Criminal-Justice-Systems.html](http://www.unodc.org/unodc/en/data-and-analysis/Seventh-United-Nations-Survey-on-Crime-Trends-and-t). We calculate the 1990s averages of countries.

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 2nd, 3rd, and 4th columns, and to the nearest 10000th in the 5th column. More accurate data are available upon request.