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RESEARCH PAPER

Longitudinal Evidence on Social Trust and Happiness in China: Causal Effects and Mechanisms

Haiyang Lu[1] · Peishan Tong[1] · Rong Zhu[2]

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Abstract
Previous studies examining the impact of social trust on happiness often face the difficulties of tackling the problems of potential endogeneity. Using an instrumental variables strategy and a two-stage residual inclusion approach, this paper explores the causal impact of social trust on individual happiness in China. We find robust evidence that a positive, causal relationship between social trust and happiness exist in China. We also find significant heterogeneity in the impact across genders and places of residence. The happiness of males and urban residents is more likely to be affected by social trust, compared to the happiness of female and rural residents, respectively. We further show that the key mechanisms through which social trust affects happiness are changes in self-reported health, social ties, perceived fairness of the society and subjective socioeconomic status.

Keywords Happiness · Social trust · Mechanism · China

1 Introduction

Happiness, as one of the significant goals of human life, is an important concept in psychological, social and economic studies (Ram 2010; Arampatzi et al. 2018). As a psychological phenomenon, happiness is usually conceptualized as an individual's overall evaluation of the quality of his or her own life (Veenhoven 1991), subjective welfare (Winkelmann 2009), and utility level (Easterlin 2001). Since the early 1970s, and especially in recent years, scholars have paid much attention to the topic of happiness, with a particular interest in its determinants. According to Easterlin (1974), income plays a momentous role in happiness, and individuals with a higher income are more likely to report higher levels of happiness.

The pioneering work of Easterlin (1974) has led to a large volume of studies on the factors influencing happiness. For instance, a growing literature has provided evidence that individual characteristics (e.g., gender, age, education, marital status) (Bjørnskov 2008), social psychological factors (e.g., distributive justice beliefs, identity, social cognition)

✉ Rong Zhu
rong.zhu@flinders.edu.au

[1] School of Public Management, Fujian Agriculture and Forestry University, Fuzhou, China

[2] College of Business, Government and Law, Flinders University, Bedford Park, Australia

(Huang 2019), and macroeconomic features (e.g., GDP, unemployment rate, income inequality captured by the Gini coefficient) (Jiang et al. 2012) are important predictors of happiness.

One strand of the ongoing research most relevant to this paper focuses on the effect of social capital on happiness (e.g., Helliwell et al. 2014). Many studies suggest that a society with a high level of social capital (such as social trust, norms and social ties) is more likely to achieve better physical and psychological health and also enhance the happiness of individuals (De Silva 2005; Maass et al. 2016). In fact, some scholars posit that social capital may be a relatively stronger predictor of happiness and life satisfaction than other widely accepted determinants such as income (Bjørnskov 2003).

These existing studies on the nexus between social capital and happiness often suffer from three main problems. A significant methodological issue is that most studies do not tackle the endogeneity issue of social capital in happiness regressions, ignoring the fact that many unobserved factors that affect both social capital and happiness-related outcomes exist (D'Hombres et al. 2009). In addition, it is likely that individuals with higher levels of happiness would be more involved in social groups and therefore have higher levels of social capital (Kuroki 2011), leading to reverse causality as well as biased and inconsistent coefficients when using standard estimation techniques such as ordinary least squares. The endogenous relationship between social capital and happiness indicates that the causal effect of social capital on happiness cannot be easily established empirically. As recently pointed out by Churchill and Mishra (2017), much of the previous research ignores the problem, while very few recent studies employ estimation techniques to address the common endogeneity issues.

Second, much of the recent literature focuses on developed countries which are quite homogeneous in terms of economic conditions or cultural background, such as the United States (e.g., Bartolini et al. 2013), Germany (e.g., Winkelmann 2009), Japan (e.g., Yamamura et al. 2015) and Korea (e.g., Han 2015). By comparison, there is not much work evaluating the correlation between social capital and happiness in developing countries. As such, the existing empirical studies have little to say about the generalizability of the conclusions and the extent to which they may apply in a developing country context.

Third, previous literature looks at how various measures of social capital relate to individual happiness, without further investigating the potential mechanisms through which social capital may impact happiness. One exception is the work by Helliwell and Putnam (2004), who consider health as a potential mechanism through which social capital may affect happiness. Given the sparse literature investigating these mechanisms, additional work is still needed in this area.

Considering the limitations of the previous studies, this paper analyzes the causal effect of social capital on happiness by using a nationally representative longitudinal dataset from China. Since the start of the economic reforms in 1978, China has experienced rapid economic growth. However, the economic progress may not necessarily translate into subjective wellbeing gains for its citizens (Liu and Zhao 2014). Moreover, previous research suggests that China is quite different from many Western societies in various aspects, such as social and economic development status, cultural values, and the trends in aging. Unlike many other transition economies, China's economic development is accompanied by fundamental but gradual social transformations without massive political or social turmoil, as had been experienced by Russia (Yip et al. 2007). In terms of cultural values, a recent work by Churchill and Mishra (2017) argues that compared with other countries such as the United States, China is ethnically homogeneous and has a relatively low ethnic fractionalization index. As such, it is expected that China

may also stand out for its high level of social trust, given that trust is generally lower in more fractionalized society (Steinhardt 2012). Unlike other countries, China does not have a strong religious culture or tradition, with relatively few individuals belonging to religious groups (Churchill and Mishra 2017). Moreover, China counts a large share of the world population. Because of the declines in fertility rate and the increases in life expectancy, China's population is aging at an unprecedented pace (Zhang and Zhang 2015). According to Ng et al. (2017), the proportion aged 60 years and over has doubled from 7.5% in 1975 to about 15% in 2017. Therefore, as the world's most populous country with the second largest economy, China offers a valuable social and cultural context for investigating the relationship between social capital and happiness.

This paper contributes to the literature on the effects of social capital on happiness in four important ways. First, the empirical literature on the causal effects of social capital on happiness is surprisingly small. We are aware of only three studies that identify this causal relationship with a serious effort to tackle the endogeneity of social capital (Kuroki 2011; Churchill and Mishra 2017; Arampatzi et al. 2018). In this paper, we rely on an instrumental variable estimation and a two-stage residual inclusion approach (or equivalently, control function approach) to address the endogeneity issue caused by simultaneity and omitted variables. More specifically, social trust is regarded as a variable of interest among all the different dimensions of social capital. We use historical migration rates and the heterogeneity of local communities as instruments for social trust, to test the causal effect of social trust in models adjusted for other important determinants of happiness.

Second, we distinguish between individual trust and aggregate social trust and also explore the moderating effect of individual trust on the link between aggregate social trust and happiness. The impact of this cross-level interaction on happiness has not received much attention empirically, although theory suggests that the promoting effects of aggregate social trust on health-related outcomes are significantly greater for high-trust individuals (Subramanian et al. 2002).

Third, we add to the literature by exploiting the underlying mechanisms for the link between social trust and happiness. Although extensive evidence has indicated that social capital can positively affect happiness, there is little statistical evidence on the potential mechanisms. Among the few studies that empirically test the mechanisms, Hommerich and Tiefenbach (2018) investigate social affiliation as a potential mechanism, and find that social capital affects social affiliation, and thereby also has an indirect effect on happiness. This work is in line with studies which find that social capital can affect happiness through pathways of social network and support (Yip et al. 2007). However, many other potentially relevant channels through which social capital affects happiness have not been empirically investigated yet.

Our random effects instrumental variable (RE–IV) and two-stage residual inclusion (2SRI) estimates show that social trust has a positive, causal effect on individual happiness. Our empirical results suggest a significant heterogeneity in the impact across genders and places of residence. The happiness of males and urban residents are affected more by social trust, when compared with that of females and rural residents. We also find a significant cross-level interaction effect between individual trust and aggregate social trust, suggesting that the happiness of respondents who have a low level of individual trust are more likely to be affected by social trust. Moreover, we find that self-reported health, individual trust, social ties, perceived fairness of society and subjective socioeconomic status are channels for the positive linkage between social trust and individual happiness.

2 Literature Review

2.1 Social Capital

Social capital is a multidimensional concept which can be recognized as a resource available to both collectives and individuals via social interactions (Han 2015). Some researchers consider social capital as a community-level concept and a 'public good', although it benefits individuals (Ekici and Koydemir 2014). It generally contains a set of features such as norms or values, social networks and social trust that provide cooperation and coordination for mutual benefit (Putnam 1995).

While there still exists some controversy about the conceptualization and measurements of social capital, most studies agree that it can be categorized into three dimensions including structural, cognitive and relational. The structural dimension of social capital refers to the social networks or social interactions of an organization that can be objectively confirmed (Han 2015). The cognitive dimension is a subjective construct pertaining to the shared vision that facilitates mutual understanding and collective orientation in an organization (Liang et al. 2015). The relational dimension refers to the trustworthiness and trust embedded in the organization or among its members (Tsai and Ghoshal 1998). As we cannot capture all the possible dimensions of social capital in our empirical analysis, we focus on one widely used indicator for social capital: the aggregate level of social trust.

Among measures of social capital, social trust is of particular importance to researchers and policymakers. Some researchers point out that social trust is the core component of social capital, which Putman (2000) defines as "connections among individuals—social networks and the norms of reciprocity and trustworthiness that arise from them". According to Newton (2001), social trust makes it possible to maintain stable and peaceful social relationships that are the basis for productive cooperation and collective behavior. Social trust is also recognized by some economists as one of the most important synthetic forces within society, which could be conducive to faster financial development and economic growth by reducing transaction costs and promoting investment (Knack and Keefer 1997; Woolcock and Narayan 2000).

2.2 Social Trust and Happiness

The association between social trust and happiness has captured the attention of researchers in the literature. Cross-country studies have generated mixed results. Most studies using regressions of social trust on happiness find significantly large and positive effects of trust on happiness or subjective well-being (Delhey and Dragolov 2016; Oshio 2017). These associations have been analyzed in various countries and periods (Helliwell et al. 2014). For instance, using data from the European Social Survey (ESS), Rodríguez-Pose and von Berlepsch (2014) find that social capital can positively impact happiness, and there are significant differences in how social trust affects happiness across different areas of Europe. Employing data from Turkey in 1999 and 2008, Ekici and Koydemir (2014) find that among social capital indicators, trust has an essential influence on life satisfaction and happiness. The rationale they provide is that trust plays an important role in connecting groups to resources and facilitating social change. The work by Ram (2010), however, suggests that the effect of social trust on happiness is generally weak and insignificant. Helliwell and Putnam (2004) find that the effect of social trust on micro-level subjective well-being is significant for the USA but not for Canada.

In addition, there are studies exploiting the possible heterogeneous effects of social trust on happiness. Using individual-level panel data from Japan, Yamamura et al. (2015) find evidence that the positive effects of social trust on happiness can be strengthened by natural disaster, especially for residents who live in the affected area. The authors further posit that social trust is a substitute for markets and formal institutions, because it mitigates the negative impact of uncontrollable shocks on mental states such as happiness.

There are many possible pathways underlying the relationship between social trust and happiness. First and foremost, trust can effectively promote cooperation, reducing transaction costs, to overcome difficulties caused by asymmetric or incomplete information, and to achieve efficient transactions in the presence of incomplete contracts (Alesina and La Ferrara 2002). Such improvements of the market environment are usually conducive to happiness. Second, people living in a society with higher social trust are more likely to feel that they belong to more trustworthy communities which are usually associated with desirable amenities such as better public goods and services, higher social cohesion and more opportunities for social contacts (Knack and Keefer 1997). Such sense of belonging also implies acceptance and inclusion by members of the group (Thoits 2011), and thus may be essential for increase in happiness. In addition, Sztompka (1998) argues that trust as a psychological trait is associated with rewarding personal relationships and caring family climate during socialization which are both conducive to happiness.

3 Data and Variable

3.1 Data

The data for this study comes from the 2012, 2014 and 2016 waves of the China Labor-Force Dynamics Survey (CLDS), which is an ongoing longitudinal panel survey conducted by the Department of Sociology at Sun Yat-Sen University in Guangzhou. The CLDS has been widely known as one of the nationally representative panel that employs multistage clustered, stratified and Probability Proportionate to Size (PPS) sampling. The content of the survey is comprehensive, containing a wide range of demographic and socioeconomic characteristics for individuals, households and communities.

The 2012 baseline data covers interviews with 10,612 households and 16,253 individuals from 116 cities across 29 mainland provinces and municipalities (excluding Tibet and Hainan). In 2014, some households and individuals were re-surveyed. The second wave includes 23,594 participants from 14,214 households. The third wave, launched in 2016, covers 14,226 households and 21,086 individuals. In this study, we restrict our attention to individuals 16 to 65 years old in the 2012–2016 sampling period. After excluding observations with missing information on key variables from our sample, we obtain an unbalanced panel consisting of 26,879 observations, with main variables and summary statistics presented in Table 1.

3.2 Outcome Variable

The main dependent variable in our empirical work is perceived happiness. Perceived happiness on a single-item scale is one of the most commonly used indicators in the literature (Haller and Hadler 2006; Arampatzi et al. 2018). It is recognized as a reliable and valid proxy, in that it is highly and positively associated with hope, self-esteem and self-rating

Table 1 Descriptive statistics of key variables: Means (standard deviations)

Variables	Mean	SD
Outcomes variable		
Happiness (5-point scale, very unhappy = 1, very happy = 5)	3.784	0.890
Variable of interest		
Aggregate social trust	0.775	0.092
Control variable		
Individual trust (high = 1, 0 otherwise)	0.775	0.417
Male (yes = 1, 0 otherwise)	0.562	0.496
Age (year)		
Married (yes = 1, 0 otherwise)	0.862	0.345
Education attainment		
Primary school or below (yes = 1, 0 otherwise)[a]	0.271	0.445
Middle school (yes = 1, 0 otherwise)	0.358	0.479
High school (yes = 1, 0 otherwise)	0.196	0.397
College (yes = 1, 0 otherwise)	0.175	0.380
Self-reported good health (yes = 1, 0 otherwise)	0.639	0.480
Medical insurance (yes = 1, 0 otherwise)	0.799	0.401
Annual income (Chinese Yuan)	9.850	1.363
Communist party member (yes = 1, 0 otherwise)	0.104	0.306
Faith status (having religious belief = 1, 0 otherwise)	0.127	0.333
Social ties (Having close friends around = 1, 0 otherwise)	0.864	0.343
Have a voting experience (yes = 1, 0 otherwise)	0.403	0.490
Perceived fairness of society (yes = 1, 0 otherwise)	0.487	0.500
Subjective socioeconomic status (10-point scale, the lowest status = 1, the highest status = 10)	4.422	1.696
Urban district (yes = 1, 0 otherwise)	0.439	0.496

[a]Base category

of both mental and physical health (Abdel-Khalek 2006). In this study, we utilize respondents' 5-point scale answer to the question "How happy are you with your life as a whole?" to measure the perceived happiness, with 1 indicating "very unhappy" and 5 indicating "very happy".

The perceived happiness is ordinal in nature, however, treating happiness as a continuous variable has been widely used and validated in the literature in the past two decades (Haller and Hadler 2006; Knight and Gunatilaka 2010; Oshio 2017; Arampatzi et al. 2018). Following the practice of Han (2015), we identify the dependent variable in two ways. One way is to treat happiness as a linear variable, with higher scores representing more happiness. The other way is to consider happiness as an ordinal variable. We find that although there are differences in coefficients between the two settings, the differences are not substantial, and the significance of association are almost the same.

Table 2 presents the percentage distribution of respondents among the five categories of happiness. We find that about 65% of the sample are happy or very happy, and that only around 7% are unhappy or very unhappy. With samples divided into annual income quintiles, the mean happiness score increases from 3.752 for respondents in the lowest quintile to 3.939 for those in the highest quintile. The modest increase in mean

Table 2 Percentage distribution of happiness, overall and by annual income quintile

Happiness category	Overall	Income quintile					
		1st	2nd	3rd	4th	5th	5th–1st
Very unhappy	1.72	2.77	1.85	1.84	1.16	0.89	−1.88
Unhappy	4.75	5.24	6.13	5.39	3.94	2.68	−2.56
So–so	28.16	23.91	29.33	33.27	29.93	24.47	0.56
Happy	44.12	50.22	43.91	38.91	41.52	45.55	−4.67
Very happy	21.25	17.86	18.78	20.59	23.45	26.41	8.55
Total observations	26,879	5382	6448	4839	5176	5034	
Mean happiness	3.784	3.752	3.717	3.710	3.822	3.939	0.187

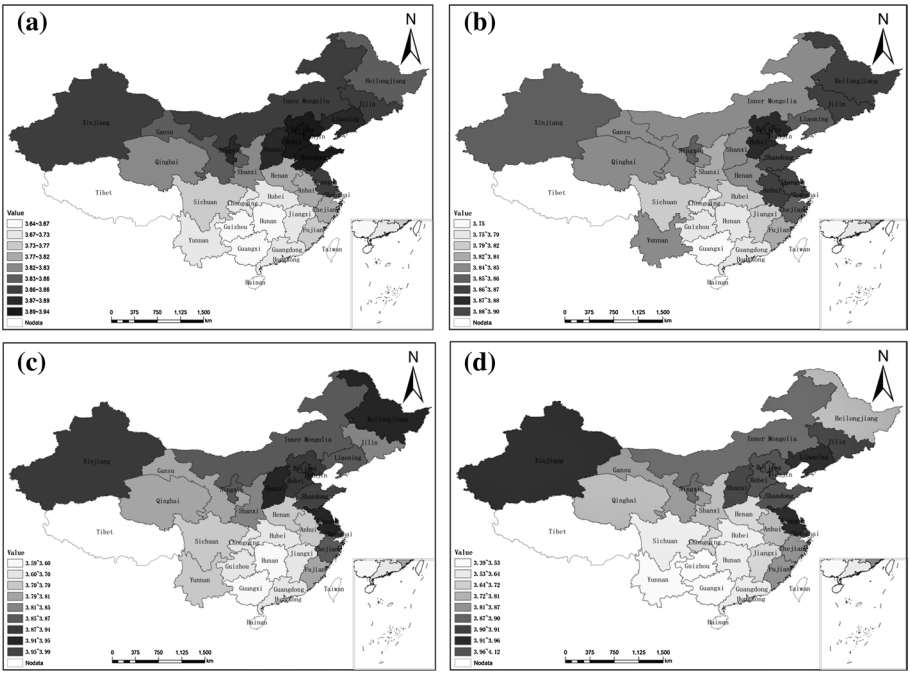

Fig. 1 **a** Maps of Happiness in China (full sample). **b** Maps of Happiness in China (2012 wave). **c** Maps of Happiness in China (2014 wave). **d** Maps of Happiness in China (2016 wave)

happiness score between the lowest quintile and the highest quintile is consistent with the trend observed in the research of Knight and Gunatilaka (2010) for China.

The regional spread scores for happiness across China's provinces is depicted in Fig. 1a. The distribution of happiness has a noticeable agglomeration of happier regions in northern China. In addition, we also observe some evolution of regional differences in the mean happiness scores between 2012 and 2016 (see Fig. 1b–c).

3.3 Key Independent Variable

The key independent variable in this study is social trust. Studies on the effects of trust mostly focus on applying a measure of generalized trust without distinguishing the different levels of trust (Bartolini et al. 2017; Churchill and Mishra 2017). Following the research of Kuroki (2011) and Yasuharu et al. (2010), we distinguish between two types of trust: individual generalized trust and aggregate social trust. The former is captured by the answer to the survey question "Would you say that most people can be trusted?". The answers range between 1 and 5, with 1 being strongly disagree and 5 being strongly agree. We operationalize it as a dichotomous measure with "agree" and "strongly agree" coded as 1, and the others as 0. The latter, aggregate social trust, is calculated using the mean score of individual generalized trust in each city.

3.4 Other Independent Variables

In order to reduce omitted variable bias, we also control for other socioeconomic and demographic covariates that may be important predictors of happiness and social trust. Based on the existing literature (e.g. Knight et al. 2009; Fuller-Iglesias 2015), we control for gender, age, marital status, educational attainment, self-reported good health, medical insurance status, annual income, Communist Party membership, faith status, social ties, voting experience, perceived fairness of society, subjective socioeconomic status and geographic location (district). Regional dummies are included in the happiness equation as a proxy for the state of local economy.

4 Empirical Strategy

To assess the effect of social trust on individual happiness, we follow the practice of Arampatzi et al. (2018) and opt for a random effects (RE) panel estimation in which we consider observations clustered within individuals, given the longitudinal structure of the dataset.

Under the assumption that most or all of the unobserved heterogeneity stems from time-invariant characteristics, fixed effects (FE) estimation can consistently estimate the coefficients on social trust. Here we prefer the RE estimation to FE estimation because the key independent variable used in the analysis is at the aggregate level, and there is little variation in the variable between 2012 and 2016. Additionally, the CLDS has a short time span, most of the variations are between individuals rather than within individuals. Under these circumstances, the use of FE estimation may not be appropriate given the little variation in social trust across waves in the CLDS data. Hence, the estimation equation is given by:

$$Happiness_{it} = \beta Aggregate\ Social\ Trust_{it} + \gamma\ Control_{it} + \varepsilon_{it} + u_i \tag{1}$$

where $Happiness_{it}$ represents the perceived happiness of individual i in year t, and $Aggregate\ Social\ Trust_{it}$ denotes the social trust of city i in year t. $Control_{it}$ is a vector of the control variables for individual i in year t, u_i is the individual random effect, and ε_{it} is the error term.

To examine the moderating effect of individual trust on the relationship between aggregate social trust and happiness, we also estimate the following equation:

$$\begin{aligned} Happiness_{it} = {} & \beta\ Aggregate\ Social\ Trust_{it} + \lambda\ Individual\ Trust_{it} \\ & + \varphi(Aggregate\ Social\ Trust_{it} \times Individual\ Trust_{it}) \\ & + \gamma\ Control_{it} + \varepsilon_{it} + u_i \end{aligned} \tag{2}$$

where $Individual\ Trust_{it}$ denotes the individual generalized trust for individual i in year t, $Aggregate\ Social\ Trust_{it} \times Individual\ Trust_{it}$ represents the interaction effect between aggregate social trust and individual generalized trust.

When using the happiness variable in a linear regression, we need to assume that the answers to satisfaction questions are fully interpersonally comparable (Ng 1997). In addition, the use of the linear specification assumes cardinality in satisfaction answers, which means that we have to assume that the difference in satisfaction between a three and a four for any individual is the same as between a four and a five for any other individual. To deal with these two concerns from using a linear specification, we estimate a random effects ordered probit (RE-OP) regression model to capture the ordinal feature of our dependent variable. We find that when RE-OP is used, neither the coefficients, nor the significance levels of both the key independent variable and control variables differ much compared to the RE analysis. This is in line with previous research by Ferrer-i-Carbonell and Frijters (2004).

As discussed above, the challenge in estimating the causal effect of social trust on happiness lies in the possibility of unobserved characteristics that may be correlated with both social trust and happiness, which would lead to an endogeneity bias. To tackle this problem, we employ random effects instrumental variable estimation (RE-IV). We follow Kuroki (2011) in using historical migration rate as an instrument for social trust. Historical migration rate is likely to serve as a valid instrument. First, it is correlated with social trust because migration reduces interactions and communications among residents and make trust harder to develop. Second, historical migration rate is unlikely to have a direct effect on individual happiness except through social trust and other variables that are included in the happiness equation. Third, we control for aggregate level factors that could be correlated with both aggregate social trust and happiness, such as per capita income, medical insurance participation rate and average age of the local population.

We also incorporate an additional instrument, which allows for the application of over-identifying tests and ensures sufficient correlation between social trust and its instruments. According to Alesina and La Ferrara (2002), individuals distrust those who are different from themselves because of 'aversion to heterogeneity'. Drawing on this perspective and following Ronconi et al. (2012), we use the heterogeneity of the local community in terms of population composition as an additional instrument. Furthermore, given that the two instruments discussed above might be correlated with regional economic development which itself is likely to affect individual happiness, region dummies are also included in the happiness equation.

In addition, to correct for endogeneity bias in ordered regression models, we employ a two-stage residual inclusion (2SRI) model when the ordinal feature of happiness is considered. In the first stage, 2SRI is similar to the popular linear two-stage least squares estimator (2SLS) in that auxiliary (reduced form) regressions are estimated, and the results are used to generate predicted values for aggregate social trust. In the second stage, however, aggregate social trust is not replaced by the first-stage predictor, instead, the first-stage residual is included as an additional regressor in second-stage estimation.

This approach was first suggested by Hausman (1978) in the linear context as a means of testing for endogeneity and was widely utilized in health economics and health services research (Terza et al. 2008). Alternatively called the control function approach, the two-stage residual inclusion (2SRI) approach is widely used to address the endogeneity problem in nonlinear econometric models (See Wooldridge 2010).

5 Empirical Results

5.1 Social Trust and Individual Happiness

We begin by analyzing the correlates of happiness. Table 3 displays the results of the happiness equation using random effects (RE) panel estimation and random effects ordered probit (RE-OP) estimation. It should be noted that we do not view these estimates as causal, but rather they demonstrate potential correlates of individual happiness in China.

The estimated coefficients on the control variables in the five specifications are very similar and broadly consistent with expectations. In particular, individual trust is positively associated with happiness, indicating that those with high generalized trust are more likely to be happy. Women are happier than men. Age and happiness manifest a U-shaped relationship, declining from a moderate level in the early years and then increasing steadily henceforth. Moreover, being married, being highly educated, having good self-reported health, having medical insurance, earning higher income, being an Communist party member, having religious belief, having higher level of social ties, perceiving that society is fair and having higher subjective socioeconomic status are all positively associated with individual happiness. The above statistical results are in line with previous studies (e.g. Huang 2019).

Social trust, the key variable of interest, has the expected sign in all models. Columns (1) and (3) in Table 3 suggest that whether including individual trust or not, the coefficient on social trust is significant and positive. Columns (4) and (5) of Table 3 provide clear evidence that individual trust moderates the relationship between social trust and happiness. Respondents who score low on generalized trust but living in a higher social trust city, on average, have a higher level of happiness, compared with those who do not trust others while living in a lower social trust city.

As we previously discussed, to address the endogeneity problem and establish the causal effect of social trust on happiness, random effects instrumental variable (RE-IV) estimation and two-stage residual inclusion (2SRI) estimation are employed. Results are reported in Table 4. The over-identification test does not reject the null hypothesis that both instruments are exogenous. The first stage F-test rejects the null of weak instruments, indicating that the two instruments are jointly and individually strong predictors of aggregate social trust. Specifically, in Columns (1) of Table 4, the first stage RE-IV estimates show that the historical migration rate is negatively associated with aggregate social trust, while the proportion of local population has a significantly positive influence on aggregate social trust.

Columns (2) and (3) of Table 4 reports the second stage of the RE-IV regression results, which estimate the causal effect of aggregate social trust on the happiness of individuals in China. We find a highly significant and positive causal effect of social trust on happiness, when the issue of potential endogeneity is addressed. Again, we detect a significant interaction effect between aggregate social trust and individual trust. In Columns (4), (5) and (6) of Table 4, we present the results from the 2SRI estimation based on the random

Table 3 Social trust and individual happiness (RE and RE-OP estimates)

Variable	RE				RE-OP
	(1)	(2)	(3)	(4)	(5)
Aggregate social trust	0.198**		0.134*	0.375**	0.525**
	(0.078)		(0.079)	(0.147)	(0.228)
Individual trust		0.077***	0.073***	0.300**	0.443**
		(0.015)	(0.015)	(0.118)	(0.183)
Aggregate social trust × Individual trust				−0.304*	−0.451*
				(0.157)	(0.243)
Male	−0.054***	−0.055***	−0.056***	−0.056***	−0.090***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.020)
Age	−0.030***	−0.030***	−0.031***	−0.031***	−0.047***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)
Age^2	0.000***	0.000***	0.000***	0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.272***	0.271***	0.271***	0.271***	0.413***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.032)
Middle school	0.106***	0.105***	0.106***	0.106***	0.158***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.025)
High school	0.140***	0.139***	0.139***	0.139***	0.214***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
College	0.194***	0.193***	0.191***	0.190***	0.292***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.037)
Self reported good health	0.245***	0.243***	0.241***	0.242***	0.371***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.021)
Medical insurance	0.041***	0.041***	0.041***	0.041***	0.065***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.023)
Income	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Communist party member	0.064***	0.065***	0.063***	0.064***	0.110***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.034)
Faith status	0.061***	0.061***	0.062***	0.061***	0.099***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.029)
Social ties	0.102***	0.100***	0.099***	0.100***	0.147***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.026)
Have a voting experience	0.047***	0.045***	0.044***	0.044***	0.069***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.020)
Perceived fairness of society	0.335***	0.329***	0.330***	0.330***	0.515***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.021)
Subjective socioeconomic status	0.090***	0.089***	0.089***	0.089***	0.136***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)
Urban district	0.057***	0.052***	0.056***	0.056***	0.088***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.023)
Intercept	3.128***	3.247***	3.151***	2.975***	
	(0.099)	(0.081)	(0.099)	(0.134)	
Region effects	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes
Observations	19,980	19,980	19,980	19,980	19,980

*p value < 0.1; **p value < 0.05; ***p value < 0.01

Table 4 Social trust and individual happiness (RE-IV and 2SRI estimates)

Dependent variable	RE-IV			2SRI		
	First stage: Aggregate social trust (1)	Second stage: Happiness (2)	Second stage: Happiness (3)	First stage: Aggregate social trust (4)	Second stage: Happiness (5)	Second stage: Happiness (6)
Historical migration rate	−0.053***			−0.011***		
	(0.007)			(0.005)		
The proportion of local population	0.150***			0.239***		
	(0.004)			(0.004)		
Aggregate social trust		1.051***	1.836***		0.505***	0.783***
		(0.338)	(0.584)		(0.178)	(0.253)
Individual trust		0.047***	0.198***		0.108***	0.392***
		(0.017)	(0.073)		(0.023)	(0.184)
Aggregate social trust×individual trust			−0.200**			−0.382
			(0.098)			(0.245)
Sargan–Hansen over-identification test	0.136					
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,980	19,980	19,980	19,980	19,980	19,980

*p value < 0.1; **p value < 0.05; ***p value < 0.01

Table 5 Effect heterogeneity by gender and place of residence

	Male	Female	Rural residents	Urban residents
Aggregate social trust	3.374***	0.129	1.423*	3.464***
	(0.898)	(0.756)	(0.781)	(1.554)
Individual trust	0.300***	0.080	0.241*	0.173*
	(0.105)	(0.103)	(0.148)	(0.095)
Aggregate social trust × individual trust	−0.373***	−0.002	−0.273	−0.151
	(0.143)	(0.136)	(0.183)	(0.148)
Constant	2.445***	3.076***	2.702***	2.973***
	(0.293)	(0.308)	(0.323)	(0.334)
Control variables	Yes	Yes	Yes	Yes
Observations	11,083	8897	11,149	8831

*p value < 0.1; ** p value < 0.05; *** p value < 0.01

effects ordered probit model to check the robustness of the causal effect of social trust on happiness. The results are similar except that the moderating effect of individual trust is significant only at the 11% level.

To capture the possible heterogeneous effects of social trust on happiness, we investigate whether the estimated effects differ by gender and place of residence. The RE-IV regression results for various subsamples are shown in Table 5. The results demonstrate a positive and statistically significant impact of social trust on happiness for males and an insignificant effect for females. Table 5 also offers evidence of heterogeneous effects of social trust on happiness by place of residence. The positive effect of social trust is mainly pronounced among urban residents. In comparison, the effect for rural residents is comparatively smaller in magnitude and is significant only at the 10% level. The estimated coefficients on the interaction term for both urban and rural residents, however, are not statistically significant.

5.2 Sensitivity Analyses

We have conducted five additional robustness checks to examine whether the effect of social trust on happiness is sensitive to different measurements, sample restrictions or econometric methods. These results are reported in Table 6. More specifically, we first construct a dichotomous happiness measure with "very happy" and "happy" coded as 1, and the others coded as 0 (Panel A). Second, in Panels B and C of Table 6, we use province-level social trust and county-level social trust, instead of city-level social trust, to evaluate the effects of aggregate social trust on happiness, respectively. Further, we assess whether our results are robust to different sample restrictions by excluding the data from the first wave in 2012 from our sample (Panel D). Finally, we incorporate more control variables that may be important predictors of happiness and social trust. They include subjective evaluation of environmental pollution, the status of local health-care infrastructure, the availability of street lights in the village/community, and the availability of nearby hospitals (Panel E). All in all, we obtain very similar results: the effects of aggregate social trust on happiness are all positive and statistically significant. More interestingly, combining the

Table 6 Sensitivity analysis

Variable of interest	Pooled OLS	RE	RE-IV	IV-probit	2SRI
Panel A: Dichotomous measure of happiness, 1 indicates happy					
Aggregate social trust	0.243***	0.240***	0.339*	0.984*	
	(0.042)	(0.043)	(0.181)	(0.538)	
Panel B: Province-level social trust					
Aggregate social trust	0.531***	0.532***	1.583***		2.093***
	(0.095)	(0.098)	(0.231)		(0.288)
Panel C: County-level social trust					
Aggregate social trust	0.122*	0.115*	0.943***		0.729**
	(0.067)	(0.069)	(0.281)		(0.327)
Panel D: Exclude wave 2012 from our sample					
Aggregate social trust	0.138*	0.134*	1.056***		0.530***
	(0.077)	(0.079)	(0.337)		(0.180)
Panel E: Include more control variables					
Aggregate social trust	0.205**	0.203**	1.118***		0.694***
	(0.079)	(0.081)	(0.334)		(0.183)

*p value < 0.1; **p value < 0.05; ***p value < 0.01

results of Columns (3) of Table 3, and these of Panel B and C of Table 6, we find that social trust at a higher administrative level has a greater magnitude on happiness.

5.3 Mechanisms Through Which Social Trust Affects Happiness

To gain deeper understanding of the beneficial effect of social trust on individual happiness in China, we investigate the channels through which social trust may affect happiness. As discussed above, there are many underlying mechanisms linking social trust to happiness. Most of the related literature suggests that social trust is likely to promote social ties and support, which may positively affect the happiness of individuals (Yip et al. 2007). Some studies also find that higher levels of social trust are associated with a lower probability of reporting poor health, leading to the improvement of happiness (Subramanian et al. 2002). Additionally, social influence/social comparison is also one pathway from social capital to mental health and well-being that has often been ignored in previous studies. Social influence through comparison may have protective or damaging consequences for happiness, depending on the reference group that the individual views as salient and the predominant beliefs about happiness within this group (Thoits 2011).

Although not all of the mediating factors can be examined with the data at hand, we can still explore whether the effect of social trust is mediated by some socioeconomic, psychosocial or cognitive factors available in our data. Following the literature, we focus on five potential mechanisms including: self-reported good health, individual trust, social ties, perceived fairness of society and subjective socioeconomic status. To this end, Sobel-Goodman mediation tests are conducted in this section. Our estimation was performed using the Stata command *sgmediation*. The results are presented in Table 7.

Panel A of Table 7 provides clear evidence supporting the mediating effect of self-reported good health. The results show that about 27% of the overall link between aggregate

Table 7 Test of mediation between migration status and health

	Coefficient	Standard error
Panel A: The mediating effect of self reported good health		
Indirect effect	0.173***	0.014
Direct effect	0.460***	0.068
Sobel–Goodman mediation tests	12.100***	
Panel B: *The mediating effect of individual trust*		
Indirect effect	0.162***	0.013
Direct effect	0.470***	0.070
Sobel–Goodman mediation tests	12.300***	
Panel C: *The mediating effect of social ties*		
Indirect effect	0.045***	0.006
Direct effect	0.382***	0.068
Sobel–Goodman mediation tests	7.340***	
Panel D: *The mediating effect of perceived fairness of society*		
Indirect effect	0.097***	0.020
Direct effect	0.581***	0.077
Sobel–Goodman mediation tests	4.879***	
Panel E: *The mediating effect of subjective socioeconomic status*		
Indirect effect	0.247***	0.019
Direct effect	0.386***	0.067
Sobel–Goodman mediation tests	12.850***	

*p value < 0.1; **p value < 0.05; ***p value < 0.01

social trust and happiness is indirect, through self-reported good health. Also, we find that aggregate social trust has significantly increased the level of individual trust. The indirect effect of aggregate social trust on happiness through individual trust is significant at the 1% level, representing about 26% of the total effect (Panel B). Moreover, aggregate social trust is positively associated with social ties (Panel C), indicating that individuals living in a city with a higher level of social trust are more likely to receive social support, which may result in increased happiness. Finally, social trust is likely to have significant positive effects on perceived fairness of society and subjective socioeconomic status, which may give rise to enhanced happiness (Panel D and E).

6 Concluding Remarks

Using nationally representative data from China Labor-Force Dynamics Survey, we show aggregate social trust has a significant causal effect on happiness. Moreover, social trust at a higher administrative level (province vs. city) has a larger impact on happiness. The empirical evidence of the positive and significant impact of social trust on happiness is robust across different empirical approaches (RE-IV and 2SRI) we use.

By examining the heterogeneity in the effect of social trust on happiness, we find that the positive impact is more pronounced for males and urban residents than it is for females and rural residents, respectively. We also draw attention to the cross-level interaction

between individual trust and aggregate social trust. The results show that while individual trust moderates the effect of aggregate social trust on happiness, that moderation matters less for females.

We further show that the beneficial effect of social trust on happiness is to a large degree a result of improvement in self-reported health. Equally important is the finding that individual trust not only has a moderating effect but it also serves as a mediating factor. Namely, a substantial portion of the effect of aggregate social trust on happiness was mediated by individual trust, indicating that higher level of social trust may lead to the improvement of individual trust, which may indirectly influence one's happiness. Also, social trust is likely to affect the receipt or the perception of social support. Such support may benefit an individual's ability to cope with stress and further has a beneficial impact on happiness. Moreover, perceived fairness of the society and subjective socioeconomic status also play an important role in mediating the relationship between social trust and happiness.

Overall, this paper is among the first to provide evidence on the causal relationship between social trust and individual happiness in China. The positive associations between the two factors have been found in various countries and in different time periods, with the endogenous nature of social trust in estimations being inadequately addressed in previous studies. Given the many differences between China and Western economies, the extent to which previous findings can be generalized is not clear. The China Labor-Force Dynamics Survey we use have information about the historical migration rate and the heterogeneity of the local community in terms of population composition, which have been utilized as the instrumental variables for social trust in our estimations. We show that there is still a positive and statistically significant causal impact of social trust on happiness, after we address the endogeneity problem of social trust. The paper also contributes to the literature by exploring the underlying mechanisms for the positive causal linkage between social trust and individual happiness.

A caveat of this research is that we only examine the causal relationship between social trust and happiness, without considering the endogeneity of other variables (e.g. individual trust). We acknowledge that data limitations make it difficult to consider endogeneity issues when conducting a formal mediation analysis. We leave these aspects for future research.

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