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Internet Use and Subjective Well-Being in China

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Abstract Using data from the 2010 China Family Panel Studies, we analyze the association between Internet use and various measures of subjective well-being (SWB) in a sample of 16- to 60-year-old Chinese. Our analysis shows that although intensive Internet use is significantly associated with lower levels of SWB, we hardly observe any associations when the focus is on participation in specific online activities. Nevertheless, SWB depends on the reasons for using the Internet and the extent to which individuals feel that their Internet use is displacing other activities. Our results suggest that, contrary to previous findings, differences in beneficial outcomes (the third level digital divide) do not necessarily arise from individuals' actual Internet use (the second level digital divide) but rather may result from their *subjective perceptions* of such usage. Our findings also point to a possible cultural factor that puts Chinese Internet users at psychological risk.

Keywords China · Digital divides · Depression · Happiness · Internet use · Life satisfaction

JEL Classification I10 · D10 · J10 · Q53

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1 Introduction

By 2008, China had outstripped the US to become the world's largest Internet user (Wang and Li 2012), with 649 million Chinese "netizens" in 2014 (China Internet Network Information Center [CINIC] 2015). Not only did the country's Internet penetration rate (the proportion of Internet users to total population) increase dramatically from 8.5 % in 2005 to 47.9 % in 2014 (CINIC 2015), but with a 2013 iGDP[1] of 4.4 %, China's Internet economy is larger than those of the US, Germany, and France (Woetzel et al. 2014). In fact, Internet-fueled GDP growth is projected to account for 7–22 % of China's total GDP increase between 2013 and 2025, thereby potentially translating into 4 trillion to 14 trillion yuan (equivalent to approximately 0.6 trillion to 2.2 trillion US dollars) in annual GDP (Woetzel et al. 2014). It is thus not surprising that the Internet has given rise to a new lifestyle fabric that has fundamentally transformed Chinese daily life (CINIC 2014).

The rapid growth of Internet use in China—combined with the use of other Information and Communication Technologies (ICTs) such as personal computers and mobile devices—may have a significant impact on individual well-being. Yet despite its growing importance, little is known about such effects among Chinese. China thus provides an interesting case study for exploring the relation between Internet use and subjective well-being (SWB) in the context of a developing non-Western environment. Such is the purpose of this paper, in which we use data from the 2010 China Family Panel Studies (CFPS) to analyze Internet use and SWB among Chinese aged 16–60.

By conducting this analysis, we make several important contributions: First, by focusing on China, we expand the limited number of nationally representative studies outside the Western world. This expansion is important because the different attitudes to and perceptions of Internet use among those from different sociocultural backgrounds (see, e.g., Brosnan and Lee 1998; Li and Kirkup 2007) make it difficult to generalize results from developed societies. Second, because mixed results from prior studies are often attributable to different definitions of Internet use and/or varying measures of SWB (Valkenburg and Peter 2007), we use both positive (life satisfaction and happiness) and negative (depression) SWB measures. We also employ two different methods for measuring Internet use: a macro approach that examines Internet use as a whole and a micro approach that focuses on specific online activities. We are thus able to produce a more differentiated picture of the association between Internet use and SWB. Third, by examining not only Internet use in practice but also reasons for Internet use, we provide valuable insights into the little-known mechanisms that drive the Internet use-SWB relation (Kross et al. 2013; Valkenburg and Peter 2007).[2] Fourth, unlike most previous research, which studies the population as a whole or focuses on specific age groups, we investigate the Internet use-SWB association across most of the adult lifespan, enabling exploration of whether this relation varies among different age groups. Fifth, this analysis is a primer in combining the study of Internet use-SWB associations with the exploration of perceived displacements in daily activities. Lastly, we examine the issue of endogeneity in Internet use, which constitutes an important step toward a fuller understanding of Internet use's impact on SWB.

[1] The iGDP indicator, which measures a country's Internet economy, employs the expenditure approach to calculate GDP. Generally, it sums up all activities associated with the creation and use of Internet networks and services (Woetzel et al. 2014).

[2] Valkenburg and Peter (2007) identify some potential mechanisms of Internet communication and well-being via social networks among Dutch adolescents aged 10–17.

The remainder of this paper is structured as follows: After reviewing the relevant prior literature, we outline the data and methodologies and then report the estimation results, beginning with descriptive statistics. We next identify the associations between different SWB measures and Internet use intensity (macro results) or different online functions (micro results). We also provide evidence of Internet use's effect on SWB by evaluating user reports on purposes for Internet use and the sacrifices made to spend time online. Finally, we discuss the potential endogeneity associated with Internet use and then conclude the paper.

2 Prior Studies

Although a burgeoning body of literature examines the Internet use-SWB relation, the nature of this association remains unclear, with some studies showing beneficial contributions and others pointing to harmful ones. These contradictions may arise for several reasons:

First, studies use different measures of SWB, including positive measures such as life satisfaction and happiness (Kavetsos and Koutroumpis 2011; Kross et al. 2013; Lelkes 2013; Pénard et al. 2013; Sabatini and Sarracino 2014) and negative measures such as depression or loneliness (Bakken et al. 2008; Bessiere et al. 2010; Campbell et al. 2006; Cotten et al. 2012; Ford and Ford 2009; Fortson et al. 2007; Morrison and Gore 2010; Nimrod 2013; Shaw and Gant 2002; Tandoc et al. 2015). We are unaware of any studies that use both positive and negative measures except for Stepanikova et al. (2010), who employ life satisfaction and loneliness as SWB proxies.

Second, studies differ in their approaches to Internet use, with most adopting either a macro approach (i.e., use vs. nonuse or intensity of use) or a micro approach (i.e., specific online activities). The studies that employ a macro approach are numerous and include, for example, the recent work of Kross et al. (2013), Lelkes (2013), Pénard et al. (2013), Sabatini and Sarracino (2014), Tandoc et al. (2015), and Wickramasinghe and Ahmad (2013). Those using a micro approach, however, are somewhat fewer (see, for example, Cotten et al. 2011; Morrison and Gore 2010; Nimrod 2013; Stepanikova et al. 2010). With the exception of three US studies (Bessiere et al. 2010; Kraut et al. 2002; Stepanikova et al. 2010), we know of no other research that simultaneously applies a combined macro–micro approach that is crucial for accurately identifying the effects of Internet use on SWB.

Third, nearly all prior studies focus on behavior (i.e., actual Internet use) and SWB, with only a few exploring the psychological factors, such as perceptions or attitudes toward Internet use. One exception is the study by Selfhout et al. (2009), which shows that Dutch adolescents who have perceived low-quality friendships surf the Internet for longer and are more likely to suffer from depression and social anxiety. Combining the study of behavior with such psychological factors may provide important insights on the mechanisms by which Internet use affects well-being.

Fourth, whereas earlier studies examine the general population (Bessiere et al. 2010; Cotten et al. 2011; Morrison and Gore 2010; Pénard et al. 2013; Wickramasinghe and Ahmad 2013) or specific age groups, such as adolescents (Selfhout et al. 2009; Valkenburg and Peter 2007) or older adults (Cotten et al. 2012; Katsamanis 2006; Lelkes 2013), we know of none that explores Internet use and well-being across the lifespan. Yet because individuals in different life stages (and different cohorts) may have different psychosocial

needs, such exploration may explain many contradictions. That is, not only can individuals be expected to vary in their uses for the Internet but also in the benefits they gain from it.

Fifth, the effect of Internet use on SWB may depend heavily on the opportunity costs associated with the time spent online; that is, which activities are being displaced by Internet use. The various notions of media displacement suggest that an increase in the use of one medium comes at the expense of other media use and activities (symmetrical displacement) and that the functions of an old medium can be replaced by those of a new one (functional displacement). Both types of displacement are considered mechanisms that regulate media use (Newell et al. 2008). Yet, despite some research on how traditional media and social activities are displaced by new media use (Nossek et al. 2015; Mannell et al. 2005, respectively), we know of none that simultaneously examines the associations between the Internet use-SWB relation and perceived patterns of displacement. It should also be noted that exploring perceived patterns of displacement may be more valuable than actual displacement because they reflect users' *judgments* of their own behavior, which may more greatly impact SWB than the behavior itself.

Finally, few studies actually address the causal relation between Internet use and SWB even though reverse causality and selection issues are omnipresent in such analyses. Of the few papers that address the endogeneity of Internet use, the most relevant for our study are those of Pénard et al. (2013) and Sabatini and Sarracino (2014). Pénard et al. (2013), using a two stage least squares (2SLS) approach with Internet diffusion among family as the instrument, find that Internet use has a significantly positive impact on SWB. In particular, they show that non-Internet users are less satisfied with life than Internet users and that the Internet has more influence on life satisfaction than on happiness. Sabatini and Sarracino (2014) also employ a 2SLS technique but use as their two instruments the share of the population within a residential region that has a DSL (digital subscriber line) connection or that has no fiber optics. Not only do these results indicate no association between online networking and life satisfaction but their estimation suggests that online networking is negatively correlated with life satisfaction.

Although the majority of the above research is for Western countries, a growing body of literature has also been emerging in China, with a primary focus on adolescence. As in Western countries, however, and for the same reasons as outlined above, the results are inconclusive. For example, Cao et al. (2011) find that, compared with normal Internet use, "problematic Internet use" (defined as scoring 50+ on the Young Internet Addiction Test[3].) increases the probability of psychosomatic symptoms and decreases life satisfaction levels among adolescents aged 10–24 in 8 Chinese cities. Likewise, Wu et al. (2013) show that, compared to nonaddictive adolescent Internet users, addictive adolescent users are more likely to have hyperactivity-impulsivity tendencies, while Lam and Peng (2010) identify a 2.5 times larger relative risk of depression in pathological Internet users aged 13–18 than in their nonpathological peers.[4] Wang and Wang (2011), in contrast, find a positive correlation between online communication and SWB among adolescents aged 15–19 from a vocational school in the southwest of China, with such effects being stronger among males than females.

[3] Each item on the 20-item Young Internet Addiction Test (YIAT) is measured on a 5-point scale ranging from "1 = not at all" to "5 = always".

[4] Pathological use of the Internet is evaluated by the self-rated 20-item Young Internet Addiction Test, a 5-point scale with scores ranging from 20 to 100, which are then used to group addiction severity into three categories: normal = 20–49, moderate = 50–79, and severe = 80–100 (Lam and Peng 2010). In Lam and Peng's (2010) study, only 10 students scored 80 points or higher, so the researchers use a binary variable (1 = severe and moderate and 0 = normal) in their analysis.

Our study, therefore, constitutes the first in-depth analysis of the Internet use-SWB relation in China and possibly the first overall to combine into one study positive and negative SWB measures, macro and micro approaches, behavior and reasons for using the Internet, Internet use and well-being across the life span, and perceived displacement patterns. As the conceptual framework for this combination, we adopt the paradigm of digital divides, in which one divisional level is associated with Internet connectivity and differentiates between users and nonusers while a second is related to the skills and abilities required for ICT use and distinguishes varying skill levels *among* ICT users (Hargittai 2002). A third level suggested more recently is linked to the various benefits of ICT use (e.g., learning and productivity) and is thus assumed to arise from the second level digital divide (Wei et al. 2011). By focusing on Internet users, our analyses of the Internet use-SWB relation allows additional exploration of the association between the second and third level digital divides; that is, between differences in usage and differences in usage outcomes. We also use an Instrumental Variable (IV) approach to examine the endogeneity of Internet use in the first level digital divide, thereby shedding light on the causal impacts of Internet use on SWB. In doing so, this study contributes not only to our understanding of China but also to the general body of knowledge on Internet use and well-being.

3 Data and Methods

3.1 Data

Our analysis is based on data from the China Family Panel Studies (CPFS), administered by Peking University's Institute of Social Science Survey, which currently encompasses two waves collected in 2010 and 2012 (Xie et al. 2014). Because it covers 25 provinces/municipalities/autonomous regions[5] that represent 95 % of the Chinese population, the CPFS is a nationally representative sample that captures both the socioeconomic development and the economic and noneconomic well-being of Chinese households (Xie, 2012). Because Internet use information is only available in the first (2010) survey wave, we restrict our analysis to these data and extrapolate a sample of 4686 Chinese Internet users aged 16–60.[6] Note that the sample includes only Internet users primarily because we focus on the second and third level digital divide. However, the first digital divide is also taken into account when we check the endogeneity of Internet use participation. Because the CFPS uses a multistage sampling design, we also take into account clustering at the village/neighborhood levels (Ren and Treiman 2014). Specifically, there are totally 597 villages or neighborhoods in our empirical sample.

3.1.1 SWB Measures

Our main proxies of SWB are life satisfaction, happiness, and depression. The first two, based on the questions "How satisfied are you with your life?" and "How happy are

[5] The 2010 CFPS encompasses 14,960 Chinese households and 42,590 individuals ($0 < \text{age} \leq 110$), excluding Hong Kong, Macao, Taiwan, Xinjiang, Qinghai, Inner Mongolia, Ningxia, and Hainan. Detailed information about sampling design is available in Xie (2012).

[6] We mainly focus on the Chinese Internet users until 60 years old because Internet use in older ages (>60) becomes very limited and heterogeneous with regards to motives. Also note that the rate of Internet use participation is only 1.5 % among people aged above 60 years olds in our sample.

you?", respectively, are measured on a 5-point scale ranging from 1 = very unsatisfied/very unhappy to 5 = very satisfied/very happy. Depression is measured on a scale ranging from 6 to 30 based on the summed scores for 6 items asking respondents how often in the previous month they experienced each of the following depression-related conditions:

1. Feel depressed and cannot cheer up;
2. Feel nervous;
3. Feel agitated or upset and cannot remain calm;
4. Feel hopeless about the future;
5. Feel that everything is difficult; and
6. Think life is meaningless.

The responses are coded as follows: 1 = almost every day, 2 = two or three times a week, 3 = two or three time a month, 4 = once a month, and 5 = never.

3.1.2 Internet Use

Internet use is measured using the two approaches to exploring second level digital divides; namely, Internet use intensity in hours/day (macro approach) and frequency of use measured on a 4-point scale (1 = rarely, 2 = several times/month, 3 = several times/week, and 4 = almost every day) or in days/week of different online functions (micro approach). These latter include search engines (e.g., Google/Baidu), business websites, Social Networking Services (SNSs, such as Facebook/Renren), blogs, games, emails, and two portals offering a variety of online services, QQ and MSN. An example item for the measure of use is "How many days per week on average do you use MSN messenger during nonvacation time?" It should be noted that in our analysis, we employ the intensity of Internet use primarily to capture individual exposure to the Internet (Pénard et al. 2013) but use Internet participation to solve potential issues of selection bias and endogeneity.

The first online portal QQ, operated by the Chinese firm Tencent, is a popular chatting platform in China, which can also be used for blogging, playing games, listening to music, and reading news (Xiao 2009). Another popular portal is MSN, operated by the Microsoft Corporation, which is more oriented to white-collar workers and thus regarded as a good communication tool in the workplace (Meng and Zuo 2008). These two portals, however, have different privacy protection policies, with QQ having lower privacy protection than MSN and thereby establishing a low-barrier system in which strangers can contact each other more easily (Meng and Zuo 2008). Because these portals differ in their privacy protection policies, target groups, and prevalence, we include both in our analysis.

3.1.3 Reasons for Internet Use and Perceived Displacement Patterns

Reasons for Internet use were measured by rating the importance of different purposes for Internet use: "During the most recent nonvacation month, how important were the purposes below for your Internet use?"

1. Entertainment;
2. Study;
3. Work;
4. Social interaction;
5. Sharing innermost thoughts and feelings with Internet friends;
6. Seeking emotional support from Internet friends;

7. Seeking professional help from Internet friends; and
8. Diversion/distraction.

Unlike the questions that referred to frequency of use of different online functions and measured actual behavior, this question referred to reasons or purposes for using the Internet. Therefore, users' rankings could, at least to some extent, indicate their motivations, a psychological factor that may help explain the Internet use-SWB associations. It should be noted, however, that this question was limited in its ability to measure users' motivations (for example, when one ranked social interaction high, we could not determine the nature of the interaction he/she was seeking online), and that only qualitative methods can provide in-depth understanding of motivations. Although the responses are ranked on a 5-point scale from 1 = very unimportant to 5 = very important, we recoded this variable into a dummy equal to 1 if the answer is important or very important and 0 otherwise.

To analyze what users give up to spend time online, we first introduce a rich set of variables that capture the time spent on daily activities, including sleeping; eating; housework; taking care of family members; full-time work; reading; watching TV/videos, and listening to radio/music; engaging in sports; hobbies, and leisure activities (e.g., calligraphy, visiting museum or art galleries); and social activities (e.g., chatting with friends or visiting relatives and friends). The corresponding question is worded as follows: "In the previous nonvacation month, how many hours per day on average did you spend participating in the following activities?" This time-use information is asked for weekdays and the weekend separately and then summed into one variable. It should also be noted that this measure is best regarded as an individual's *perceived* time use because answers to such recall questions are known to be systematically biased and influenced by social desirability effects (Sousa-Poza 1999). We also employ a direct measure of the association between TV and Internet use based on the following item: "Since you began using the Internet, the time you spend watching TV has 1 = increased dramatically, 2 = increased a little, 3 = not changed, 4 = decreased a little, or 5 = decreased dramatically." We directionally rescale this variable to range from 1 = decreased dramatically to 5 = increased dramatically.

3.1.4 Individual Characteristics

We complement the above variables with the following set of individual characteristics: age, gender, employment status, marital status, education, self-reported relative income, and self-reported health. Age is first grouped into five categories ($1 = 16 \leq \text{age} \leq 19$, $2 = 20 \leq \text{age} \leq 29$, $3 = 30 \leq \text{age} \leq 39$, $4 = 40 \leq \text{age} \leq 49$, and $5 = 50 \leq \text{age} \leq 60$) and then recoded as a dummy variable with $16 \leq \text{age} \leq 19$ as the reference group. Gender is a dummy equal to 1 if the respondent is male and 0 otherwise, and employment status is equal to 1 if the respondent is currently employed (0 otherwise). Marital status is measured on a 5-point scale of 1 = unmarried, 2 = married, 3 = living together, 4 = divorced, and 5 = widowed and then recoded as a dummy with unmarried as the reference category. Education levels are coded as 1 = illiterate, 2 = primary school, 3 = middle school, 4 = high school, 5 = vocational school, and 6 = university or higher and then converted to a dummy with illiterate as the reference group. Because income and health are important predictors for SWB (Frey and Stutzer 2002), we include self-reported relative income and health (as in Pénard et al. 2013). The first is measured on a 5-point scale based on the question "What is your income level in your local area?", which is rated from 1 = very low to 5 = very high. The second is captured as follows: "How would you rate your health

status? 1 = healthy, 2 = fair, 3 = relatively unhealthy, 4 = unhealthy and 5 = very unhealthy," which we again reverse directionally so that larger values denote better self-rated health. We also introduce an urban dummy (1 = urban, 0 = rural) and a provincial dummy with Beijing as the reference province.[7]

3.2 Estimation Methods

3.2.1 Internet Use and SWB

Because our measures of life satisfaction and happiness are ordinal, we adopt an ordered probit estimation based on the following model:

$$\mathrm{SWB}_i = \beta_0 + \beta_1 IUI_i + \beta_2 IUI_i * AG + \beta_3 X_i + \beta_4 P + \beta_5 U + \varepsilon_i \quad (1)$$

where SWB_i represents the SWB of individual i in terms of life satisfaction and happiness, and IUI_i denotes the intensity of individual i's Internet use. AG is an age group dummy encompassing $1 = 16 \leq \text{age} \leq 19$, $2 = 20 \leq \text{age} \leq 29$, $3 = 30 \leq \text{age} \leq 39$, $4 = 40 \leq \text{age} \leq 49$, and $5 = 50 \leq \text{age} \leq 60$, with 16- to 19-year-olds as the reference group. X_i is a vector of individual i's characteristics. P represents a provincial dummy, U denotes an urban dummy, β_1 is the key coefficient of interest, and ε_i is the error term. In addition, we introduce an OLS estimation to analyze depression with specifications as in Eq. (1).

3.2.2 Online Functions Use and SWB

We use a micro approach to examine the Internet use-SWB association. Specifically, we analyze how time spent on a variety of online functions associates with our three measures of SWB and employ an ordered probit model to assess the impact of online functions use on both life satisfaction and happiness with the following model:

$$\mathrm{SWB}_i = \beta_0 + \beta_1 OFU_i + \beta_2 OFU_i * AG + \beta_3 X_i + \beta_4 P + \beta_5 U + \varepsilon_i \quad (2)$$

where SWB_i represents the SWB of individual i in terms of life satisfaction and happiness, and OFU_i represents the frequency of individual i's use of various online functions, including QQ, MSN, emails, blogs, social networking services, search engines, games and business websites. We also employ an OLS estimation to analyze depression.

3.2.3 Reasons for Internet Use

To analyze the associations between the different reasons for Internet use and SWB, we estimate the following models:

$$\mathrm{SWB}_i = \beta_0 + \beta_1 IP_i + \beta_2 IP_i * AG + \beta_3 X_i + \beta_4 P + \beta_5 U + \varepsilon_i \quad (3)$$

where SWB_i represents the depression, life satisfaction, or happiness of individual i. IP_i is a binary variable indicating the importance of the reasons for individual i's Internet use (i.e., entertainment; study; work; social interaction; sharing thoughts/feelings, seeking emotional support, or seeking professional help from Internet friends; and diversion/

[7] Specifically, the 25 provinces/municipalities/autonomous regions in the CFPS are Beijing, Tianjin, Hebei, Shanxi, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi and Gansu (Xie 2012).

distraction). *AG* represents an age group dummy encompassing the five age groups ($1 = 16 \leq \text{age} \leq 19$, $2 = 20 \leq \text{age} \leq 29$, $3 = 30 \leq \text{age} \leq 39$, $4 = 40 \leq \text{age} \leq 49$, and $5 = 50 \leq \text{age} \leq 60$) with 16- to 19-year-olds as the reference category. X_i is a vector of individual i's characteristics, P represents a provincial dummy, U denotes an urban dummy, and ε_i is the error term.

3.2.4 Perceived Displacement

To assess how Internet use influences (perceived) time arrangements for 10 daily activities (sleeping; eating; housework; taking care of family members; full-time work; reading; watching TV/videos or listening to radio/music; engaging in sports; hobbies, or leisure activities; and social activities), we introduce the following double-log model:

$$LOGTDA_i = \alpha_0 + \alpha_1 LOGIUI_i + \varepsilon_i \tag{4}$$

where $LOGTDA_i$ and $LOGIUI_i$, respectively, denote the translog time (hours/day) that individual i spends on these 10 daily activities or surfing the Internet. ε_i is the error term.

3.2.5 Endogeneity

To account for any endogeneity stemming from the likelihood that some omitted variables may affect Internet use and SWB simultaneously and that more satisfied individuals may be more inclined to surf the Internet (Pénard et al. 2013), we adopt a two stage least squares (2SLS) approach.[8] In doing so, we follow Sabatini and Sarracino (2014) by using one instrument that can be readily shown to be exogenous to SWB but closely related to Internet use; namely, the number of Internet broadband access terminals (IBCT, measured in 10,000 s) at the provincial or municipality level (Ministry of Industry and Information Technology of the People's Republic of China 2010). For this analysis, using the conditional mixed process (CMP) estimator proposed by Roodman (2011), we employ a probit model with Internet use as a binary variable for the first stage regression and then run the second stage regression using an ordered probit model in which the dependent variable is our SWB measure. The first stage regression is modeled as follows:

$$IU_i = 1(\alpha_0 + \alpha_1 Z + \alpha_2 X_i + \omega_i > 0), \quad \omega_i \sim N(0,1) \tag{5}$$

where IU_i denotes whether individual i surfs the Internet with a computer and is equal to 1 if yes and 0 otherwise. X_i is a vector of the covariates of individual i excluding the instrument variable, Z represents the instrument (i.e., the number of Internet broadband access terminals), and ω_i is the error term.

The model for the second stage estimation is written as

$$SWB_i = \begin{cases} 1, & \text{if} \quad y_i \leq 0 \\ 2, & \text{if} \quad 0 < y_i \leq \pi_1 \\ \vdots & \\ 5, & \text{if} \quad \pi_5 < y_i \end{cases} \tag{6}$$

where $0 < \pi_1 < \pi_2 < \cdots < \pi_5$, and the subscript i indicates individual i. π_i are unknown parameters to be estimated.

[8] Because a considerable share of our respondents do not use the Internet and the decision to do so may be related to reported SWB, our analysis may be subject to sample selection bias.

For the second stage,

$$SWB_i = \beta_0 + \beta_{1i}\widehat{IU_i} + \beta_2 X_i + \varepsilon_i, \varepsilon_i \sim N(0,1) \quad (7)$$

where SWB_i denotes individual i's SWB (life satisfaction and happiness), $\widehat{IU}i$ is the predicted probability from the first stage regression of the individual surfing the Internet with a computer, X_i is a vector of covariates, and ε_i is the error term. For our depression measure, we employ a traditional 2SLS estimation (using the CMP estimator) whose specification is similar to Eqs. 6 and 7.

4 Results

4.1 Descriptive Statistics

Our sample of Internet users consists of 4686 Chinese individuals aged 16–60 who reported using a computer to surf the Internet.[9] Consistent with the results from the 2014 SRIDC (CINIC 2014) and reflecting the relative newness of Internet technology in China, these users are predominantly male (56 %) and were relatively young (average age = 31) at the time of survey. Most were employed (70 %) and married (65 %), and reported high levels of education and income, as well as good health. Most users (73 %) also resided in urban areas (for more details, see Appendix Table 8).

On average, respondents reported spending around 2.3 h per day surfing the Internet with a computer. The most time-consuming online activities (measured in days/week) were using multiservice web portals (QQ and MSN) and emails, while the least popular activities were blogging and visiting business websites. It is also worth noting that the intensity of QQ use was slightly stronger (about 5 days/week) than that of MSN messenger use (3.9 days/week), suggesting a possible preference for local information and communication and/or for lower privacy protection that enables easier contact with strangers (Meng and Zuo 2008). Among the different reasons for Internet use, use for work or study were relatively important, whereas sharing thoughts or feelings or seeking emotional support and professional help from Internet friends were less important. As to the primary location for Internet use, the home was still the most common access site (66 % of all users) compared to the workplace (17 %) or Internet cafés (10 %).[10]

4.2 Internet Use and SWB

Our analysis of the association between Internet use intensity (a macro measure) and SWB reveals no significant association between such intensity and life satisfaction (see Table 1, columns 1–2). We do, however, note a negative association between Internet use intensity and happiness, with marginal effects equal to about 2.7 %. One interesting observation is that this negative effect is almost completely attenuated by the interaction terms with age, implying that the negative association between Internet use intensity and happiness is predominantly driven by the young reference group aged 16–19. In older age groups, little

[9] This number suggests an Internet penetration rate of approximately 20 % (i.e., 4686/23,836), which is lower than the 34 % reported in the *2014 Statistical Report on Internet Development in China* (SRIDC), primarily because our study only considers individuals that surf the Internet with a computer, which excludes those that do so using, for example, a mobile device.

[10] These unreported results are available from the authors upon request.

evidence emerges that Internet use intensity is associated with happiness. Similarly, and consistent with several prior studies (see Bessiere et al. 2010; Fortson et al. 2007; Stepanikova et al. 2010), there is a negative association between Internet use intensity and depression scores (see columns 5 and 6), which, although the magnitudes are quite small, implies that more Internet use is associated with slightly higher levels of depression. Once again, the interaction terms with age indicate that this association is primarily driven by the youngest group (aged 16–19). We also note in passing a nonlinearity in the nexus between age and SWB—particularly, life satisfaction and happiness (see columns 1–4)—which is well in line with certain other studies (see, e.g., Blanchflower and Oswald 2008).

4.3 Online Functions Use and SWB

In contrast to the macro approach, our micro approach to analyzing the Internet use-SWB relation reveals only a few negative associations (see Table 2 for a summary of the main findings). In fact, the time spent on the various online functions barely correlates with any of our three SWB measures. For the population in general, we do note that longer time exposure to MSN use is significantly linked with a decrease in happiness, albeit at a quite small magnitude (with a marginal effect of around 0.12, see Appendix Table 9). However, once time spent on MSN use is interacted with different age groups, happiness consistently increases, especially among working-age individuals (20–49). Because MSN messenger, although less popular in China than QQ, is significantly and positively associated with SWB while QQ is not, it is possible that the opportunities for international information and communication that it offers, especially for working-age Chinese, provides them with a sense of being part of the world community and enhances their well-being.

Among older citizens (50–60), however, social networking generally gives rise to negative associations, which contradicts previous reports of a positive link between social use of the Internet and SWB in later life (e.g., Cotten et al. 2012; Ford and Ford 2009; Lelkes 2013). Given that these latter studies were conducted primarily in Western societies, this contradiction may suggest a culture-related difference. For example, intense use of a social networking site by older Chinese adults might reflect an unsuccessful attempt to compensate for few or unsatisfying offline social interactions and social isolation.

By showing that most online functions are unassociated with SWB—and that the few associations found are not necessarily negative and limited to specific age groups—our findings reveal a considerable contrast between the macro and micro analyses. On the macro level, there is a clear negative association between Internet use and SWB, but such an association does not exist on the micro level. Hence, the negative association between Internet use and SWB does not appear to be a result of a specific harmful online activity. This suggests that it is not what people *do* online, but rather how they *feel* about using the Internet more generally, that may explain the negative associations between Internet use and SWB found in this study.

4.4 Possible Mechanisms by Which Internet Use Affects SWB

We propose two possible mechanisms by which Internet use may affect users' feelings about their usage and consequently their SWB: the reasons for Internet use, which may indicate user motivations, and perceived sacrifices for more time spent online, which may throw more light on user attitudes than on behavior.

Table 1 Ordered probit estimates/OLS for Internet use on subjective well-being (adults aged 16–60)

Variable	Ordered probit model (marginal effects)				OLS	
	LS (1)	LS (2)	Happiness (3)	Happiness (4)	Depression (5)	Depression (6)
IUI	−0.007 (0.006)	−0.005 (0.006)	−0.027** (0.011)	−0.026** (0.011)	−0.232*** (0.077)	−0.215*** (0.075)
20–29	−0.099*** (0.019)	−0.090*** (0.019)	−0.132*** (0.041)	−0.122*** (0.041)	−0.603** (0.258)	−0.416* (0.249)
30–39	−0.105*** (0.022)	−0.089*** (0.021)	−0.213*** (0.044)	−0.189*** (0.044)	−0.494* (0.290)	−0.150 (0.276)
40–49	−0.107*** (0.023)	−0.082*** (0.023)	−0.261*** (0.047)	−0.222*** (0.047)	−0.668** (0.330)	−0.120 (0.314)
50–60	−0.070*** (0.027)	−0.039 (0.027)	−0.238*** (0.055)	−0.190*** (0.054)	−0.477 (0.377)	0.175 (0.363)
IUI X 20–29	0.007 (0.006)	0.006 (0.006)	0.029** (0.012)	0.028** (0.012)	0.210** (0.084)	0.197** (0.082)
IUI X 30–39	0.007 (0.006)	0.006 (0.007)	0.028** (0.012)	0.027** (0.012)	0.207** (0.086)	0.197** (0.083)
IUI X 40–49	0.003 (0.007)	0.001 (0.007)	0.034** (0.014)	0.031** (0.014)	0.158 (0.125)	0.131 (0.118)
IUI X 50–60	−0.006 (0.009)	−0.006 (0.009)	0.024 (0.018)	0.024 (0.017)	0.401*** (0.104)	0.394*** (0.103)
Unhealthy		0.070 (0.087)		−0.183 (0.154)		−1.427 (0.876)
Relatively unhealthy		0.074 (0.083)		−0.149 (0.150)		−0.148 (0.756)
Fair		0.128 (0.082)		−0.067 (0.148)		1.390** (0.633)
Healthy		0.200** (0.082)		0.063 (0.147)		2.713*** (0.636)
N	4686	4686	4471	4471	4664	4664
Pseudo R^2/ Adj. R^2	0.040	0.052	0.033	0.047	0.029	0.100

The dependent variable is life satisfaction (LS, measured on a 5-point scale), happiness (measured on a 5-point scale), or depression (measured on a scale ranging from 6 to 30). The controls for models (1), (3), and (5) are Internet use intensity (IUI, hours/day), an age group dummy, the interaction of the age group dummy with Internet use intensity, male, employment status, marital status, education, relative income, and an urban dummy. The controls for models (2), (4), and (6) are the same as those for (1) but with the addition of self-reported health. Marginal effects are reported for life satisfaction (very satisfied) and happiness (very happy). Village/neighborhood-clustered robust standard errors are in parentheses

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

4.4.1 Reasons for Internet Use

Table 3 reports the association between the importance ascribed to the different purposes for Internet use and life satisfaction. As the table shows, reporting study or work as reasons for Internet use is positively related with life satisfaction, with marginal effects of 7.2 and 4.6 %, respectively (columns 2 and 3), suggesting that when the Internet is used as a means

Table 2 A general summary of online functions and SWB

Online functions	SWB indicators		
	LS	Happiness	Depression
QQ	Not significant	Not significant	Not significant
MSN	Not significant	*Positive effect only among working-age individuals*	Not significant
Email	Not significant	Not significant	Not significant
Blog	Not significant	Not significant	Not significant
Social networking site	*Negative effect only among older users*	*Negative effect only among older users*	*Negative effect only among older users*
Search engine	Not significant	Not significant	Not significant
Game website	Not significant	Not significant	Not significant
Business website	Not significant	Not significant	Not significant

The table is based on regressions in which the dependent variable is life satisfaction (LS, measured on a 5-point scale), happiness (measured on a 5-point scale), or depression (measured on a scale from 6 to 30). Results for MSN and social networking sites are given in Appendix Tables 9 and 10. Other regression results are available upon request. Significance is at the 5 % level

for attaining a valuable goal, its use is positively associated with life satisfaction. The interaction terms in the lower half of the table further indicate that the positive coefficient associated with Internet use for study is being driven by the youngest respondents (aged 16–19). On the other hand, those who report diversion or distraction as reasons for using the Internet are less likely to be very satisfied with life, with a marginal effect of 3.5 % (column 8). This outcome may imply that, conversely, when the Internet is used as a means for reaching a nonvaluable goal, its use is negatively correlated with life satisfaction.[11]

We then estimate how the reasons for Internet use affect happiness (see Table 4). As in the case of life satisfaction, respondents who report study or work as reasons for Internet use are more likely to have higher levels of happiness, with marginal effects of approximately 0.16 and 0.1, respectively (columns 2 and 3), perhaps again indicating the importance of achieving a valuable goal.

Finally, we evaluate the association between the different reasons for Internet use and depression (see Table 5). In contrast to our other two SWB measures, the likelihood of depression decreases in both those that report entertainment and seeking professional help as reasons for Internet use, although at the relatively small magnitudes of 0.72 and 0.58, respectively (columns 1 and 7). Furthermore, in the case of entertainment, the interaction terms between this reason for use and age groups indicate that this association is attenuated in nearly all age groups compared to the reference category aged 16–19 (column 1).

In this analysis of the associations between various reasons for Internet use and SWB, two key points are worth highlighting: First, for the positive measures, we do observe significant associations with valuable reasons for use such as work and study, suggesting that a sense of "doing the right thing" via the Internet may contribute to SWB. For the negative measure, we see significant associations with such therapeutic reasons for use as entertainment and receiving professional help, meaning that in cases of depression, more

[11] Nevertheless, it is important to emphasize that causality may be the opposite: individuals that are less satisfied with life may perceive the Internet as an important means for diversion and distraction.

Table 3 Ordered probit estimates for reasons for Internet use on life satisfaction (adults 16–60)

Variable	Entertainment	Study	Work	Social interaction	Share thoughts	Emotional support	Professional help	Diversion/ distraction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Importance	0.012 (0.024)	0.072*** (0.019)	0.046** (0.022)	−0.009 (0.021)	0.015 (0.029)	−0.014 (0.035)	0.043 (0.031)	−0.035* (0.021)
20–29	−0.082*** (0.016)	−0.051*** (0.017)	−0.072*** (0.017)	−0.106*** (0.017)	−0.083*** (0.014)	−0.085*** (0.014)	−0.073*** (0.014)	−0.097*** (0.016)
30–39	−0.083*** (0.019)	−0.055*** (0.019)	−0.072*** (0.019)	−0.096*** (0.020)	−0.082*** (0.016)	−0.085*** (0.016)	−0.076*** (0.016)	−0.096*** (0.018)
40–49	−0.088*** (0.020)	−0.056*** (0.020)	−0.081*** (0.020)	−0.092*** (0.020)	−0.076*** (0.017)	−0.084*** (0.017)	−0.072*** (0.018)	−0.100*** (0.019)
50–60	−0.063*** (0.023)	−0.022 (0.025)	−0.046* (0.024)	−0.066*** (0.023)	−0.048** (0.021)	−0.054** (0.021)	−0.048** (0.022)	−0.072*** (0.023)
Interactions of the importance dummy with age group dummy								
X 20–29	0.001 (0.025)	−0.062*** (0.022)	−0.023 (0.024)	0.045** (0.022)	0.010 (0.031)	0.032 (0.037)	−0.041 (0.033)	0.039* (0.023)
X 30–39	−0.003 (0.026)	−0.058*** (0.022)	−0.026 (0.025)	0.024 (0.024)	−0.010 (0.037)	0.011 (0.046)	−0.037 (0.035)	0.028 (0.026)
X 40–49	0.022 (0.031)	−0.050** (0.024)	−0.002 (0.027)	0.021 (0.027)	−0.051 (0.042)	0.025 (0.069)	−0.049 (0.036)	0.052* (0.030)
X 50–60	0.033 (0.035)	−0.064* (0.033)	−0.012 (0.033)	0.031 (0.039)	−0.064 (0.059)	−0.108** (0.053)	−0.019 (0.044)	0.055 (0.038)
N	4985	4984	4982	4982	4979	4979	4977	4982
Pseudo R^2	0.053	0.054	0.054	0.053	0.053	0.052	0.052	0.052

The dependent variable is life satisfaction (measured on a 5-point scale). The controls are a dummy for the importance of the different purposes of surfing the Internet, an age group dummy, and the interaction of the age group dummy with the importance dummy, male, employment status, marital status, education, self-reported income ladder, an urban dummy, and self-reported health. Marginal effects are reported for life satisfaction (very satisfied). Village/neighborhood-clustered robust standard errors are in parentheses

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 4 Ordered probit estimates for reasons for Internet use on happiness (adults 16–60)

Variable	Entertainment	Study	Work	Social interaction	Share thoughts	Emotional support	Professional help	Diversion/ distraction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Importance	−0.024	0.161***	0.098**	−0.020	−0.011	0.011	0.083	−0.021
	(0.054)	(0.052)	(0.050)	(0.049)	(0.051)	(0.074)	(0.071)	(0.049)
20–29	−0.077**	−0.017	−0.045	−0.108***	−0.069**	−0.062**	−0.051*	−0.076**
	(0.033)	(0.033)	(0.034)	(0.037)	(0.030)	(0.028)	(0.030)	(0.036)
30–39	−0.135***	−0.074**	−0.102***	−0.160***	−0.125***	−0.125***	−0.112***	−0.126***
	(0.037)	(0.037)	(0.039)	(0.042)	(0.035)	(0.032)	(0.034)	(0.039)
40–49	−0.189***	−0.082**	−0.130***	−0.195***	−0.161***	−0.154***	−0.134***	−0.172***
	(0.039)	(0.040)	(0.040)	(0.042)	(0.037)	(0.034)	(0.036)	(0.040)
50–60	−0.171***	−0.089*	−0.113**	−0.175***	−0.147***	−0.137***	−0.132***	−0.130***
	(0.045)	(0.047)	(0.046)	(0.046)	(0.043)	(0.041)	(0.042)	(0.047)
Interactions of importance dummy with age group dummy								
X 20–29	0.041 (0.057)	−0.107** (0.054)	−0.036 (0.052)	0.090* (0.050)	0.039 (0.054)	0.014 (0.078)	−0.053(0.07 4)	0.039 (0.052)
X 30–39	0.019 (0.059)	−0.129** (0.056)	−0.055 (0.055)	0.070 (0.054)	−0.054 (0.063)	−0.041 (0.090)	−0.087 (0.076)	−0.019 (0.056)
X 40–49	0.097 (0.063)	−0.169*** (0.059)	−0.051 (0.057)	0.106* (0.059)	0.004 (0.079)	−0.080 (0.116)	−0.130 (0.083)	0.050 (0.062)
X 50–60	0.109 (0.073)	−0.110* (0.064)	−0.037 (0.066)	0.122 (0.075)	0.141 (0.108)	0.131 (0.157)	0.028 (0.098)	−0.044 (0.076)
N	4741	4740	4738	4738	4735	4735	4733	4738
Pseudo R^2	0.045	0.047	0.047	0.048	0.045	0.045	0.046	0.045

The dependent variable is happiness (measured on a 5-point scale). The controls are a dummy for the different purposes of surfing the Internet, an age group dummy, and the interaction of the age group dummy with the importance dummy, male, employment status, marital status, education, self-reported income ladder, an urban dummy, and self-reported health. Marginal effects are reported for life satisfaction (very satisfied). Village/neighborhood-clustered robust standard errors are in parentheses

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Internet use may help mitigate depression. This is well in line with the negative associations between Internet use and depression reported by Nimrod (2013) for 16 English language-based communities located in Australia, the US, Canada and the UK, and Tandoc et al. for the US (2015).

4.4.2 Perceived Displacement

To analyze users' perceptions of what is given up to spend time online, we run a double-log model (in which the coefficients represent elasticities) to determine how time spent using the Internet relates to perceived time spent on different daily activities. As Table 6 shows, in general, time spent using the Internet is negatively associated with perceived time spent sleeping, doing household chores, taking care of family, and working, with elasticities of 0.5, 5.3, 4.9, and 2.1 %, respectively. The results here are consistent with the interpretation of results in the previous section.[12] Additionally, longer time exposure to the Internet is positively associated with perceived time spent eating, reading, or engaging in sports and social activities, with elasticities of 1.5, 3.1, 4.7, and 2.3 %, respectively, which suggests that Internet use is also perceived as a hedonic activity. We observe no association, however, between time exposure to the Internet and watching TV (perhaps signaling no media displacement) or engaging in hobbies.[13]

Overall, the impacts of Internet use intensity on SWB are quite heterogeneous, especially once we introduce the reasons for Internet use and perceived displacements. In fact, based on the findings reported in Sects. 4.3 and 4.4, it is not what users do online but rather how they perceive and judge their Internet use that is associated with their well-being. More specifically, our findings indicate that Chinese Internet users perceive their usage as a frivolous activity that often distracts them from doing more important things such as working and/or taking care of their homes and families. It also seems that individuals only feel good about Internet use when its purpose is to achieve valuable goals (e.g., study or work), connect them with the outside world (MSN messenger), and/or alleviate depression, thereby contributing to their performance in the important life domains of home and work.

[12] Although we do not test for causality, our results could imply that heavy Internet users may be less happy and more depressed because they feel guilty for neglecting important responsibilities such as work, housework, or taking care of family, especially given that, in spite of rapid modernization, the Chinese still believe in strong traditional values. Interestingly, Davis et al. (1992) find that, in the workplace, the US people' intentions to adopt computer technology are primarily influenced their perceptions for the usefulness of the computer technology (utilitarian values) for improving job performance and productivity, and less by the degree of enjoyment (hedonic values), which is further echoed by Igbaria et al. (1995) among Finnish professional and managers. Similarly, using data from an electric Webpage survey in Singapore, Teo et al. (1999) show that Internet users use the Internet primarily because they perceive the Internet to be more useful to their job tasks, and only secondarily because it is enjoyable and easy to use, suggesting that perceived usefulness is more important that perceived ease of use and perceived enjoyment in affecting Internet usage.

[13] Because the 2010 CFPS provides information on the substitution between Internet use and time spent watching TV (by asking whether the latter has increased or decreased substantially since Internet use began), we also run an ordered probit model with TV watching as the dependent variable. We find that time spent on Internet use decreases the probability of spending more time watching TV, implying that longer Internet exposure may reduce viewing time. The estimation results, although not reported here, are available from the authors upon request.

Table 5 OLS estimates for reasons for Internet use on depression (adults 16–60)

Variable	Entertainment (1)	Study (2)	Work (3)	Social interaction (4)	Share thoughts (5)	Emotional support (6)	Professional help (7)	Diversion/distraction (8)
Importance	0.719*** (0.270)	0.123 (0.336)	−0.329 (0.310)	0.063 (0.310)	−0.435 (0.346)	−0.488 (0.434)	0.582* (0.353)	−0.453 (0.318)
20–29	0.346 (0.244)	0.094 (0.283)	−0.036 (0.229)	0.103 (0.265)	0.049 (0.219)	0.041 (0.213)	0.176 (0.228)	−0.022 (0.243)
30–39	0.595** (0.275)	0.417 (0.308)	0.249 (0.261)	0.388 (0.291)	0.282 (0.249)	0.320 (0.242)	0.478* (0.256)	0.221 (0.267)
40–49	0.576* (0.302)	0.402 (0.365)	0.217 (0.297)	0.431 (0.319)	0.269 (0.277)	0.312 (0.271)	0.427 (0.292)	0.201 (0.299)
50–60	1.299*** (0.337)	0.783** (0.396)	0.806** (0.332)	1.029*** (0.348)	0.979*** (0.295)	1.031*** (0.294)	1.221*** (0.312)	0.896*** (0.327)
Interactions of the importance dummy with the age group dummy								
X 20–29	−0.698** (0.299)	−0.051 (0.356)	0.265 (0.329)	−0.063 (0.341)	0.083 (0.382)	0.344 (0.482)	−0.542 (0.381)	0.239 (0.350)
X 30–39	−0.678** (0.316)	−0.187 (0.370)	0.213 (0.340)	−0.133 (0.346)	0.161 (0.426)	−0.096 (0.606)	−0.759* (0.387)	0.252 (0.369)
X 40–49	−0.768** (0.360)	−0.265 (0.430)	0.155 (0.402)	−0.523 (0.448)	−0.421 (0.588)	−1.798 (1.392)	−0.821 (0.525)	0.081 (0.456)
X 50–60	−0.525 (0.453)	0.673 (0.458)	0.670 (0.426)	0.261 (0.462)	0.724 (0.635)	0.711 (1.148)	−0.916 (0.579)	0.522 (0.469)
Constant	23.192*** (1.147)	23.461*** (1.159)	23.683*** (1.143)	23.499*** (1.148)	23.678*** (1.149)	23.576*** (1.143)	23.475*** (1.159)	23.716*** (1.142)
N	4963	4962	4960	4961	4958	4958	4956	4960
Adj. R^2	0.098	0.098	0.097	0.098	0.099	0.100	0.097	0.098

The dependent variable is depression (measured on a scale ranging from 6 to 30). The controls are a dummy for the importance of different purposes for surfing the Internet, an age group dummy, and the interaction of the age group dummy with the importance dummy, male, employment status, marital status, education, self-reported income ladder, an urban dummy, and self-reported health. Village/neighborhood-clustered robust standard errors are in parentheses

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 6 Double-log estimates for Internet use on daily activities (adults 16–60)

Variable	Sleeping	Eating	Housework	Caring for family	Work	Reading	Watching TV	Sports	Hobbies	Social activities
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
TIU	−0.005**	0.015*	−0.053***	−0.049***	−0.021*	0.031**	0.016 (0.011)	0.047***	−0.009	0.023*
	(0.002)	(0.008)	(0.011)	(0.018)	(0.012)	(0.013)		(0.015)	(0.019)	(0.014)
Constant	2.783***	0.896***	0.921***	1.184***	2.683***	0.665***	1.255***	0.601***	0.970***	0.831***
	(0.003)	(0.012)	(0.015)	(0.021)	(0.014)	(0.016)	(0.013)	(0.017)	(0.020)	(0.016)
N	4747	4739	2913	1815	1253	2195	3477	1268	1173	2301
Adj. R^2	0.001	0.001	0.006	0.004	0.002	0.002	0.000	0.007	0.000	0.001

The dependent variables are translog time (hours/day) spent on various daily activities during the weekdays/weekends; namely, sleeping, eating, household chores, taking care of family members, work, reading, watching TV, engaging in sports or hobbies, and social activities. The only control is translog time (hours/day) spent on Internet use (TIU). Village/neighborhood-clustered robust standard errors are in parentheses

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 7 Conditional mixed process (CMP) 2SLS estimates for Internet use on subjective well-being (adults 16–60)

Variable	Life satisfaction CMP (1)	Happiness CMP (2)	Depression 2SLS (3)
Internet use participation	0.123* (0.068)	0.420*** (0.060)	−4.878*** (0.085)
Instrumental variable			
Terminals	0.362*** (0.109)	0.386*** (0.108)	0.318*** (0.094)
F statistics	102.15	84.53	151.20
Chi2	11,011.90	10,720.36	17,796.64
N	29,361	29,361	29,361

The dependent variable is life satisfaction (measured on a 5-point scale), happiness (measured on a 5-point scale), or depression (measured on a scale ranging from 6 to 30). The controls are participation in Internet use, age, age squared, male, employment status, marital status, education, self-reported income, an urban dummy, and self-reported health. The instrumental variable is the number of Internet broadband access terminals (in 10,000 s) at the provincial/municipality level. Standard errors are in parentheses

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

4.5 Endogeneity

When we apply Roodman's (2011) mixed process estimator to our three SWB measures, the IV estimates reveal that participation in Internet use (measured by the question: "Do you use a computer to surf the Internet?", with the responses of 1 = yes and 0 = no) is correlated with an increase in both life satisfaction and happiness but also with an increase in depression (see Table 7).[14] The difference between these results and those based on Internet use intensity in Table 1 suggests that participation may have a different effect on SWB than intensity of use. In fact, combining these first stage IV estimates with the test of joint significance of the coefficients underscores the relevance of the number of Internet broadband access terminals as an instrumental variable. As might be expected, such telecommunication facilities increase Internet access and boost the probability of surfing the Internet.

5 Conclusions

This study extends the existing literature by focusing on a non-Western developing country, incorporating both positive and negative measures of SWB, and employing a novel combination of macro and micro approaches to measuring Internet use. It also combines measures of practical Internet use with reasons for Internet use and perceived displacement, examines the association between Internet use and SWB in different age groups, and addresses the selection and endogeneity issues associated with the Internet use-SWB relation. Not only does this multidimensional approach enable a thorough and accurate examination of the Internet use-SWB association in China, it contributes important insights to the general body of knowledge on Internet use and well-being.

[14] As highlighted by Pénard et al. (2013), relative to Internet use participation, the intensity of Internet use (e.g. frequencies of Internet use) is a better proxy for individual's exposure to the Internet. More importantly, it is able to capture the "intent-to-use" in a better fashion.

The analysis is, however, subject to certain limitations, including a lack of the longitudinal data that are crucial to furthering our understanding of the Internet's impact on SWB (Kraut et al. 2002). Our data are also restricted to computer-based Internet use, which prevents exploration of SWB's association with Internet usage on mobile devices. It is also worth emphasizing that some search engines such as Google and social networking services like Facebook are highly restricted in China, which may impair the effects of Internet use on SWB. Methodologically, we admit that multiple item measures of SWB would be preferable, although the type of single item SWB indicators used here is quite common in economics. We also admit that in our attempt to explore the causal relation between Internet use and SWB, we cannot completely rule out endogeneity. As regards any attempt to analyze the displacements caused by Internet use, of course the ideal would be to use precise time-use information. Nevertheless, our data on perceived time use provide valuable information on displacement-related *perceptions*, which may be more relevant than actual displacements when assessing Internet use's effect on SWB. Also, the ability of the reasons for Internet use to measure the motivations is somewhat limited, thereby requiring more accurate techniques like qualitative methods to provide further understanding of motivations. Finally, although the explanatory power of most of our models is comparable with existing studies (see for instance, Wang and Wang 2011), it remains low.

In particular, the study yields the following important findings. First, the association between Internet use intensity and SWB is negative: in general, intense use is unassociated with life satisfaction, negatively associated with happiness, and conjunct with higher levels of depression. These outcomes are well in line with several studies from Western countries (see, e.g., Bessiere et al. 2010; Fortson et al. 2007).[15] Second, and also in line with earlier research (e.g., Selfhout et al. 2009; Valkenburg and Peter 2007),[16] we identify certain cross-generational differences that suggest younger cohorts may be more vulnerable to the potentially negative effects of Internet use on well-being. Finally, although we observe no significant negative associations between use of specific online functions and SWB, our analyses do indicate that Chinese users' perceptions of Internet use are rather negative. More specifically, unless the Internet is used to pursue such (perceived to be) valuable goals as work or study, Chinese may regard it as a hedonic activity that distracts users from pursuing more worthwhile activities.

Our findings thus imply that the specific reason for using the Internet (rather than the online activity per se) is an important nuance in any analysis of the Internet use-SWB relation. In other words, it is not the specific online activities people participate in but rather their reasons for using the Internet and the extent to which they believe that their Internet use is displacing other, more important activities that may affect their SWB. This observation throws new light on an important principle from digital divide paradigm. That is, it suggests that, rather than the third level digital divide (the various ICT use outcomes) necessarily arising from the second level digital divide (actual ICT use) as suggested by Wei et al. (2011), it may instead stem from how individuals *perceive* the uses to which the Internet is put.

[15] Bessiere et al. (2010), using a 2000–2002 national US panel survey of 740 individuals, find that health-related Internet use is associated with increased depression. Likewise, Forton et al. (2007) also confirm that higher frequencies of Internet use for meeting people, socially experiment, and participating in chatting rooms are related to more depressive symptoms among US undergraduate students.

[16] Selfhout et al. (2009) provide the evidence that for Dutch adolescents with low-quality friendships, spending more time on Internet activities is associated with increased depression and social anxiety. Similarly, Valkenburg and Peter (2007) find that Internet communications are correlated with decrease in well-being among Dutch adolescents.

Nevertheless, when discussing the Internet use-SWB connection in China, we must take into account that Chinese Internet users are rather novice and should thus be regarded as "digital immigrants" (Prensky 2001). It is therefore quite probable that the Internet use-SWB associations in China will change over time as the Internet becomes more prevalent and users become more experienced. Nor can we ignore the role of cultural factors. In spite of rapid modernization and greater openness to the world, China is still a traditional culture with strong work and family ethics. Hence, as long as Internet use is perceived as a negative activity that distracts users from valuable life goals, the negative associations identified here should be regarded as a threat to SWB in China. Thus, future research should explore not only causality and trends (in Internet usage and perceptions, as well as their effects) but also possible interventions to change negative perceptions. Such interventions, by helping Chinese users see the Internet as a means for attaining valuable goals and performing significant roles, could turn the Internet into an instrument that positively impacts both the economy and quality of life.

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Appendix

See Tables 8, 9 and 10.

Table 8 Descriptive statistics

Variable	Number of observations	Mean	SD	Min	Max
SWB indicators					
Life satisfaction	4686	3.415	0.994	1	5
Happiness	4471	4.028	0.896	1	5
Depression	4664	27.380	3.121	8	30
Internet use indicators					
Internet use intensity (hours/day)	4686	2.295	2.121	0.02	14
QQ use intensity (days/week)	3948	5.013	2.298	1	7
MSN use intensity (days/week)	457	3.882	2.512	1	7
Email use intensity (days/week)	2181	3.393	2.445	1	7
Blog	1233	2.015	1.160	1	4
Social networking site	679	2.440	1.250	1	4
Search engine	3709	2.915	1.231	1	4
Game website	1670	2.411	1.256	1	4
Business website	1748	2.173	1.165	1	4

Table 8 continued

Variable	Number of observations	Mean	SD	Min	Max
Reasons for Internet use					
Entertainment	4683	3.195	1.203	1	5
Study	4683	3.354	1.183	1	5
Work	4680	3.313	1.376	1	5
Social interaction	4680	3.140	1.226	1	5
Sharing innermost thoughts/feelings	4677	2.133	1.183	1	5
Seeking emotional support	4677	1.733	0.992	1	5
Seeking professional help	4675	2.216	1.280	1	5
Diversion/distraction	4680	2.745	1.362	1	5
Individual characteristics					
Age	4686	31.433	10.195	16	60
Gender	4686	0.561	0.496	0	1
Employment status	4686	0.705	0.456	0	1
Educational level					
Illiterate	4686	0.011	0.106	0	1
Primary school	4686	0.076	0.265	0	1
Middle school	4686	0.315	0.465	0	1
High school	4686	0.275	0.447	0	1
Vocational school	4686	0.182	0.386	0	1
University	4686	0.140	0.347	0	1
Marital status					
Unmarried	4686	0.322	0.467	0	1
Married	4686	0.650	0.477	0	1
Living together	4686	0.007	0.084	0	1
Divorced	4686	0.017	0.130	0	1
Widowed	4686	0.003	0.056	0	1
Relative income levels					
Very low	4686	0.235	0.424	0	1
Low	4686	0.243	0.429	0	1
Middle	4686	0.455	0.498	0	1
High	4686	0.060	0.238	0	1
Very high	4686	0.007	0.086	0	1
Self-reported health					
Very unhealthy	4686	0.002	0.046	0	1
Unhealthy	4686	0.016	0.124	0	1
Relatively unhealthy	4686	0.029	0.169	0	1
Fair	4686	0.337	0.473	0	1
Healthy	4686	0.616	0.486	0	1

Table 8 continued

Variable	Number of observations	Mean	SD	Min	Max
Urban	4686	0.728	0.445	0	1

Source China Family Panel Studies 2010

Life satisfaction is measured on a 5-point scale ranging from 1 = very unsatisfied to 5 = very satisfied, happiness is measured on a 5-point scale ranging from 1 = very unhappy to 5 = very happy, and depression is measured on a scale ranging from 6 to 30. Internet use intensity is measured in terms of hours per day. Participation in Internet use is a dummy (1 = yes, 0 = no). Reasons for surfing the Internet (entertainment; study; work; social interaction; sharing innermost thoughts and feelings, seeking emotional support, or seeking professional help from Internet friends; and diversion/distraction) is a binary variable (1 = very important/important, 0 otherwise), gender (1 = male, 0 = female), employment status (1 = currently employed, 0 = currently unemployed), and the dummy for urban resident (1 = urban, 0 = rural). Marital status is measured on a 5-point scale (1 = unmarried, 2 = married, 3 = living together, 4 = divorced, and 5 = widowed, with unmarried as the reference). Education is measured on a 6-point scale (1 = illiterate, 2 = primary school, 3 = middle school, 4 = high school, 5 = vocational school, and 6 = university or higher, with illiterate as the reference). Both relative income level (from 1 = very low to 5 = very high) and self-reported health are also measured on 5-point scales (the latter as 1 = very unhealthy, 2 = unhealthy, 3 = relatively unhealthy, 4 = fair and 5 = healthy, with very unhealthy as the reference)

Table 9 Ordered probit estimates/OLS for MSN use on subjective well-being (adults aged 16–60)

Variable	Ordered probit model (marginal effects)		OLS
	LS	Happiness	Depression
MSN use	0.025 (0.043)	−0.115** (0.052)	0.132 (0.737)
20–29	−0.156 (0.099)	−0.765*** (0.185)	0.448 (1.761)
30–39	−0.153 (0.101)	−0.801*** (0.186)	0.700 (1.805)
40–49	−0.052 (0.132)	−0.897*** (0.245)	1.555 (2.252)
50–60	−0.011 (0.136)	−0.860*** (0.261)	2.023 (2.255)
MSN use X 20–29	−0.021 (0.043)	0.124** (0.052)	−0.130 (0.740)
MSN use X 30–39	−0.019 (0.043)	0.122** (0.051)	−0.129 (0.758)
MSN use X 40–49	−0.034 (0.045)	0.152*** (0.058)	−0.122 (0.769)
MSN use X 50–60	−0.049 (0.046)	0.139** (0.063)	−0.116 (0.771)
Male	−0.057*** (0.016)	−0.131*** (0.035)	−0.002 (0.303)
Employed	−0.037 (0.028)	−0.054 (0.057)	−0.030 (0.433)
Educational level			
Primary school	−0.115 (0.123)	0.075 (0.193)	−7.527*** (1.789)
Middle school	0.029 (0.070)	0.584*** (0.172)	−2.718** (1.293)
High school	0.102 (0.070)	0.608*** (0.165)	−2.868** (1.268)
Vocational school	0.076 (0.069)	0.537*** (0.173)	−3.234** (1.272)
University or higher	0.095 (0.069)	0.585*** (0.169)	−3.238** (1.253)
Marital status			
Married	0.037* (0.021)	0.179*** (0.041)	1.295*** (0.333)
Living together	−0.028 (0.057)	0.489** (0.220)	1.531*** (0.549)
Divorced	−0.023 (0.066)	−0.178 (0.119)	0.773 (0.804)
Widowed			
Income ladder 2nd	0.070*** (0.027)	0.058 (0.070)	0.767 (0.610)
Income ladder 3rd	0.119*** (0.027)	0.122* (0.065)	1.207** (0.554)

Table 9 continued

Variable	Ordered probit model (marginal effects)		OLS
	LS	Happiness	Depression
Income ladder 4th	0.195*** (0.035)	0.145* (0.085)	0.928 (0.713)
Income ladder 5th	0.297*** (0.035)	0.244*** (0.073)	4.344*** (0.826)
Urban	0.004 (0.026)	0.059 (0.057)	0.102 (0.497)
Self-reported health			
Unhealthy	−0.108 (0.070)	−0.399*** (0.121)	−3.001 (2.371)
Relatively unhealthy	−0.043 (0.057)	−0.137 (0.123)	–
Fair	−0.047*** (0.016)	−0.050 (0.036)	0.387 (1.070)
Healthy	–	–	1.998* (1.062)
N	457	441	455
Pseudo R^2/Adj. R^2	0.110	0.109	0.157

The dependent variable is life satisfaction (LS, measured on a 5-point scale), happiness (measured on a 5-point scale) and depression (measured on a scale ranging from 6 to 30). Controls are MSN use intensity (days/week), dummies of age groups (1 = 16–19, 2 = 20–29, 3 = 30–39, 4 = 40–49 and 5 = 50–60, 16–19 as the reference group), the interaction of dummies of age groups and MSN use intensity, male (1 = male, 0 = female), employment status (1 = currently employed, 0 = currently unemployed), marital status (measured on a 5-point scale, 1 = unmarried, 2 = married, 3 = living together, 4 = divorced and 5 = widowed, unmarried as the reference), education (measured on a 6-point scale, 1 = illiterate, 2 = primary school, 3 = middle school, 4 = high school, 5 = vocational school and 6 = university or higher, illiterate as the reference), self-reported income ladder (measured on a 5-point scale, from 1 = very low to 5 = very high), urban dummy (1 = urban, 0 = rural), provincial dummies (Beijing as the reference) and self-reported health (measured on a 5-point scale, 1 = very unhealthy, 2 = unhealthy, 3 = relatively unhealthy, 4 = fair and 5 = healthy, very unhealthy as the reference). Marginal effects are reported for life satisfaction and happiness. Village/neighborhood-clustered robust standard errors are in parentheses

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 10 Ordered probit estimates/OLS for social networking site (SNS) use on subjective well-being (adults aged 16–60)

Variable	Ordered probit model (marginal effects)		OLS
	LS	Happiness	Depression
SNS: several times/month	−0.001 (0.069)	−0.024 (0.227)	1.117 (0.949)
SNS: several times/week	0.026 (0.062)	−0.325 (0.219)	1.638* (0.861)
SNS: almost every day	0.009 (0.067)	−0.106 (0.242)	−0.739 (1.004)
20–29	−0.097* (0.050)	−0.144 (0.139)	0.561 (0.734)
30–39	−0.102* (0.055)	−0.274* (0.144)	−0.576 (0.865)
40–49	−0.062 (0.067)	−0.304* (0.167)	−0.950 (1.198)
50–60	−0.011 (0.095)	0.107 (0.262)	2.944 (1.828)
20–29 X SNS: several times/month	0.012 (0.075)	0.049 (0.236)	−1.470 (1.052)
20–29 X SNS: several times/week	−0.017 (0.066)	0.329 (0.225)	−1.989** (0.927)
20–29 X SNS: almost every day	0.019 (0.069)	0.142 (0.243)	0.391 (1.044)
30–39 X SNS: several times/month	−0.046 (0.090)	−0.104 (0.254)	−0.092 (1.060)
30–39 X SNS: several times/week	−0.042 (0.070)	0.287 (0.228)	−1.897 (1.281)
30–39 X SNS: almost every day	−0.003 (0.075)	0.119 (0.248)	0.397 (1.248)

Table 10 continued

Variable	Ordered probit model (marginal effects)		OLS
	LS	Happiness	Depression
40–49 X SNS: several times/month	0.020 (0.107)	0.257 (0.284)	−1.016 (1.832)
40–49 X SNS: several times/week	0.002 (0.086)	0.232 (0.263)	−0.100 (1.544)
40–49 X SNS: almost every day	0.019 (0.122)	0.178 (0.273)	4.013*** (1.440)
50–60 X SNS: several times/month	–	–	–
50–60 X SNS: several times/week	–	–	–
50–60 X SNS: almost every day	−1.039*** (0.139)	−0.842*** (0.269)	0.859 (1.865)
Male	−0.030** (0.014)	−0.049 (0.030)	0.131 (0.240)
Employed	−0.023 (0.021)	0.007 (0.042)	0.163 (0.367)
Educational level			
Primary school	−0.110 (0.109)	0.204 (0.157)	1.750 (1.437)
Middle school	−0.095 (0.099)	0.178 (0.137)	1.535 (1.272)
High school	−0.111 (0.098)	0.133 (0.127)	2.518* (1.289)
Vocational school	−0.103 (0.098)	0.167 (0.126)	1.753 (1.258)
University or higher	−0.099 (0.098)	0.141 (0.122)	1.933 (1.299)
Marital status			
Married	0.058*** (0.017)	0.218*** (0.032)	1.070*** (0.279)
Living together	−0.048 (0.063)	0.219 (0.138)	0.062 (1.420)
Divorced	−0.089 (0.056)	0.018 (0.114)	1.865** (0.773)
Widowed	0.002 (0.146)	−0.263 (0.229)	0.334 (1.907)
Income ladder 2nd	0.037* (0.021)	0.016 (0.048)	−0.255 (0.390)
Income ladder 3rd	0.077*** (0.021)	0.058 (0.044)	0.441 (0.379)
Income ladder 4th	0.078** (0.034)	0.075 (0.079)	1.470** (0.616)
Income ladder 5th	0.255*** (0.078)	0.355** (0.143)	1.922*** (0.722)
Urban	−0.018 (0.017)	0.038 (0.042)	−0.197 (0.339)
Self-reported health			
Unhealthy	0.154 (0.117)	−1.533*** (0.243)	2.670 (2.347)
Relatively unhealthy	0.237*** (0.088)	−1.547*** (0.243)	3.066 (2.402)
Fair	0.299*** (0.077)	−1.453*** (0.219)	4.691*** (1.657)
Healthy	0.365*** (0.078)	−1.298*** (0.218)	6.247*** (1.650)
N	679	618	674

Table 10 continued

Variable	Ordered probit model (marginal effects)		OLS
	LS	Happiness	Depression
Pseudo R^2/Adj. R^2	0.072	0.096	0.122

The dependent variable is life satisfaction (LS, measured on a 5-point scale), happiness (measured on a 5-point scale), or depression (measured on a scale from 6 to 30). the controls are social networking site (SNS) use intensity (1 = rarely, 2 = several times/month, 3 = several times/week and 4 = almost every day), an group dummy (1 = 16–19, 2 = 20–29, 3 = 30–39, 4 = 40–49, and 5 = 50–60, with 16–19 as the reference group), the interaction of the age group dummy and social networking site use intensity, male (1 = male, 0 = female), employment status (1 = currently employed, 0 = currently unemployed), marital status (measured on a 5-point scale:1 = unmarried, 2 = married, 3 = living together, 4 = divorced and 5 = widowed, with unmarried as the reference), education (measured on a 6-point scale: 1 = illiterate, 2 = primary school, 3 = middle school, 4 = high school, 5 = vocational school and 6 = university or higher, with illiterate as the reference), self-reported income ladder (measured on a 5-point scale from 1 = very low to 5 = very high), an urban dummy (1 = urban, 0 = rural), a provincial dummy (with Beijing as the reference), and self-reported health (measured on a 5-point scale: 1 = very unhealthy, 2 = unhealthy, 3 = relatively unhealthy, 4 = fair, and 5 = healthy, with very unhealthy as the reference). Marginal effects are reported for life satisfaction and happiness. Village/neighborhood-clustered robust standard errors are in parentheses

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

References

Bakken, I. J., Wenzel, H. G., Götestam, K. G., Johansson, A., & Oren, A. (2008). Internet addiction among Norwegian adults: A stratified probability sample study. *Scandinavian Journal of Psychology, 50*, 121–127.

Bessiere, K., Pressman, S., Kiesler, S., & Kraut, R. (2010). Effects of internet use on health and depression: A longitudinal study. *Journal of Medical Internet Research, 12*, e6.

Blanchflower, D. G., & Oswald, A. J. (2008). Is well-being U-shaped over the life cycle? *Social Science and Medicine, 66*, 1733–1749.

Brosnan, M., & Lee, W. (1998). A cross-cultural comparison of gender differences in computer attitudes and anxieties: The United Kingdom and Hong Kong. *Computers in Human Behaviour, 14*, 559–577.

Campbell, A. J., Cumming, S. R., & Hughes, I. (2006). Internet use by the socially fearful: Addiction or therapy? *CyberPsychology & Behavior, 9*, 69–81.

Cao, H., Sun, Y., Wan, Y., Hao, J., & Tao, F. (2011). Problematic Internet use in Chinese adolescents and its relation to psychosomatic symptoms and life satisfaction. *BMC Public Health, 11*, 802.

China Internet Network Information Center. (2014). *Thirty-third statistical report on Internet development in China*. Beijing: CINIC.

China Internet Network Information Center. (2015). *Thirty-fifth statistical report on Internet development in China*. Beijing: CINIC.

Cotten, S. R., Ford, G., Ford, S., & Hale, T. M. (2012). Internet use and depression among older adults. *Computers in Human Behavior, 28*, 496–499.

Cotten, S. R., Goldner, M., Hale, T. M., & Drentea, P. (2011). The importance of type, amount, and timing of Internet use for understanding psychological distress. *Social Science Quarterly, 92*, 119–139.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology, 22*, 1111–1132.

Ford, G. S., & Ford, S. G. (2009). Internet use and depression among the elderly. Phoenix Center Policy Paper No. 38, Washington, D.C.

Fortson, B. L., Scotti, J. R., Chen, Y. C., Malone, J., & Del Ben, K. S. (2007). Internet use, abuse, and dependence among students at a southeastern regional university. *Journal of American College Health, 56*, 137–144.

Frey, B., & Stutzer, A. (2002). What can economists learn from happiness research? *Journal of Economic Literature, 40*, 402–435.

Hargittai, E. (2002). Second-level digital divide: Differences in people's online skills. *First Monday, 7*, 1–20.
Igbaria, M., Iivari, J., & Maragahh, H. (1995). Why do individuals use computer techonology? *Information & Management, 5*, 227–238.
Katsamanis, I. (2006). Computer use and predictors of life satisfaction among older adult computer users. Unpublished doctoral dissertation, Carlos Albizu University, Doral, FL.
Kavetsos, G., & Koutroumpis, P. (2011). Technological affluence and subjective well-being. *Journal of Economic Psychology, 32*, 742–753.
Kraut, R., Kiesler, S., Boneva, B., Cumming, S. R., Helgeson, V., & Crawford, A. (2002). Internet paradox revisited. *Journal of Social Issues, 58*, 49–74.
Kross, E., Verduyn, P., Demiralp, E., Park, J., Lee, D. S., Lin, N., et al. (2013). Facebook use predicts declines in subjective well-being in young adults. *PLoS One, 8*, e69841.
Lam, L. T., & Peng, Z. W. (2010). Effect of pathological use of the Internet on adolescent mental health: A prospective study. *Archives of Pediatrics and Adolescent Medicine, 164*, 901–906.
Lelkes, O. (2013). Happier and less isolated: Internet use in old age. *Journal of Poverty and Social Justics, 21*, 33–46.
Li, N., & Kirkup, G. (2007). Gender and cultural differences in Internet use: A study of China and the UK. *Computers & Education, 48*, 301–317.
Mannell, R. C., Kaczynski, A. T., & Aronson, R. M. (2005). Adolescent participation and flow experience in physically active leisure and electronic media activities: Testing the displacement hypothesis. *Loisir et Société/Society and Leisure, 28*, 653–675.
Meng, Z. L., & Zuo, M. Y. (2008). Why MSN lost to QQ in [the] China market? Different privacy protection design. *International Journal of Security and Its Applications, 4*, 81–87.
Ministry of Industry and Information Technology of the People's Republic of China. (2010). *2009 national statistical bulletin of telecommunication*. Beijing: MIITPRC.
Morrison, C. M., & Gore, H. (2010). The relationship between excessive Internet use and depression: A questionnaire-based study of 1319 young people and adults. *Psychopathology, 43*, 121–126.
Newell, J., Pilotta, J. J., & Thomas, J. C. (2008). Mass media displacement and saturation. *International Journal on Media Management, 10*, 131–138.
Nimrod, G. (2013). Challenging the internet paradox: Online depression communities and well-being. *International Journal of Internet Science, 8*, 30–48.
Nossek, H., Adoni, H., & Nimrod, G. (2015). Is print really dying? The state of print media use in Europe. *International Journal of Communication, 9*, 365–385.
Pénard, T., Poussing, N., & Suire, R. (2013). Does the Internet make people happier? *Journal of Socio-Economics, 46*, 105–116.
Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*, 1–6.
Ren, Q., & Treiman, D. J. (2014). Living arrangements of the elderly in China and consequences for their emotional well-being. Working Paper No. WP14-001, Institute of Social Science Survey, Peking University.
Roodman, D. (2011). Fitting fully observed recursive mixed-process models with CMP. *Stata Journal, 11*, 159–206.
Sabatini, F., & Sarracino, F. (2014). Online networks and subjective well-being. MPRA Paper No. 56436, University Library of Munich.
Selfhout, M. H. W., Branje, S. J. T., Delsing, M., Ter Bogt, T. F. M., & Meeus, W. H. J. (2009). Different types of Internet use, depression, and social anxiety: The role of perceived friendship quality. *Journal of Adolescence, 32*, 819–833.
Shaw, L. H., & Gant, L. M. (2002). In defense of the Internet: The relationship between Internet communication and depression, loneliness, self-esteem, and perceived social support. *Cyberpsychology & Behavior, 5*, 157–171.
Sousa-Poza, A. (1999). How does the level of education affect the allocation of women's time to non-market labour? Discussion Paper No. 62. Research Institute for Labour Economics and Labour Law, University of St. Gallen, Switzerland.
Stepanikova, I., Nie, N. H., & He, X. (2010). Time on the Internet at home, loneliness, and life satisfaction: Evidence from panel time-diary data. *Computers in Human Behaviour, 26*, 329–338.
Tandoc, E. C., Ferrucci, P., & Duffy, M. (2015). Facebook use, envy, and depression among college students: Is facebooking depressing? *Computers in Human Behavior, 43*, 139–146.
Teo, T. S. H., Vivien, K., Lim, G., Raye, Y., & Lai, C. (1999). Intrinsic and extrinsic motivation in Internet usage. *Omega. International Journal of Management Science, 27*, 25–37.
Valkenburg, P. M., & Peter, J. (2007). Internet communications and its relation to well-being: Identifying some underlying mechanisms. *Media Psychology, 9*, 43–58.

Wang, Q. B., & Li, M. H. (2012). Home computer ownership and Internet use in China: Trends, disparities, socioeconomic impacts, and policy implications. *First Monday, 17*, 2–6.
Wang, J., & Wang, H. (2011). The predictive effects of online communication on well-being among Chinese adolescents. *Psychology, 2*, 359–362.
Wei, K.-K., Teo, H.-H., Chan, H. C., & Tan, B. C. Y. (2011). Conceptualizing and testing a social cognitive model of the digital divide. *Information Systems Research, 22*, 170–187.
Wickramasinghe, C. N., & Ahmad, N. (2013). Influence of Internet usage on social and subjective well-being of Sri Lankan GLIS. *Journal of Happiness & Well-being, 1*, 70–84.
Woetzel, J., Orr, G., Lau, A., Chen, Y., Chang, E., Seong, J., et al. (2014). *China's digital transformation: The Internet's impact on productivity and growth.* San Francisco: McKinsey Global Institute.
Wu, X., Chen, X., Han, J., Meng, H., Luo, J., Nydegger, L., & Wu, H. (2013). Prevalence and factors of addictive Internet use among adolescents in Wuhan, China: Interactions of parental relationship with age and hyperactivity-impulsivity. *PLoS One, 8*, e61782.
Xiao, H. (2009). Study on QQ-medium-oriented ideological and political education of college students. *Asian Social Science, 5*, 74–77.
Xie, Y. (2012). *China Family Panel Studies 2010 Users Manual*. Beijing: Institute of Social Science Survey, Peking University.
Xie, Y., Hu, J., & Zhang, C. (2014). The China Family Panel Studies (CFPS): Design and practice. *Chinese Journal of Sociology (Shehui), 34*, 1–33.