

## Article

# The Impact of Internet Use on the Well-Being of Rural Residents

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**Abstract:** With the full penetration of the Internet, the Internet has had a great impact on the production and life of rural residents. The article takes a rural residents' group as its research object to explore the impact mechanism. Leveraging data from the Chinese Family Panel Studies (CFPS) in 2016, we employ a multivariate ordered logit model as an empirical approach to delve into the various dimensions of Internet usage. By examining different facets of Internet utilization, we aim to assess the effects of these distinct uses on the well-being of rural residents. Furthermore, we investigate the mediating role of social capital in understanding the collective well-being of this demographic. The findings of this study are as follows: (1) The utilization of the Internet yields a positive impact on the well-being of rural residents. (2) Social networks exhibit a significant positive influence on the well-being of rural residents; social solidarity demonstrates a significant negative impact on the well-being of rural residents. Additionally, social trust is found to have a significant negative effect on the well-being of rural residents. (3) Regarding mobile phone access, we identify a positive and significant effect on the well-being of rural residents when mediated by social networks and social trust. In contrast, social mutual aid does not exhibit a significant mediating effect. Among the patterns of mobile phone usage, social network and social mutual aid within the realm of social capital emerge as intermediate variables that affect the well-being of rural residents through Internet usage. However, it is worth noting that social trust does not have a significant effect in this regard. These results contribute to our understanding of how Internet usage and social capital interact to shape the well-being of rural communities.

**Keywords:** Internet use; social capital; mediating effects; rural residents' well-being



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## 1. Introduction

The China Internet Information Center (CNNIC) published the 46th Statistical Report on the Development Status of the Internet in China. The report revealed that by June 2020, China had reached a staggering 940 million Internet users, with a penetration rate of 52.3% in rural areas and 76.4% in urban areas. Specifically, the number of rural Internet users accounted for 30.4% of the total, with 285 million users, while urban Internet users constituted 69.6%, totaling 654 million users. The comprehensive integration of the Internet into various aspects of life has provided significant support for China's economic development, poverty alleviation, and urbanization, playing an indispensable role in enhancing the well-being and livelihoods of individuals. Therefore, it holds immense theoretical and practical significance to investigate the influence of Internet usage on the well-being of rural residents and its underlying mechanisms.

In recent years, as Internet usage has become more prevalent, scholars have increasingly focused on examining its impact on individual well-being. Previous studies have primarily explored the effects of Internet use on specific age groups, such as children, teenagers, and the elderly. Findings suggest that Internet usage can yield both positive and negative consequences. Positive effects include knowledge expansion, portable communication, curiosity cultivation, and stress reduction for adolescents. However, negative effects, such as hindering learning, time wastage, exposure to violent content, vision loss, and privacy breaches, have also been identified [1,2]. Similarly, among the elderly population, Internet use, particularly through platforms like WeChat, has been associated with increased feelings of loneliness and boredom, influencing their social connectedness [3]. Nevertheless, other studies have highlighted the benefits of Internet use for older adults in terms of seeking timely help and information exchange, contributing to their overall health and well-being [4]. In comparison, Internet use appears to have a more significant positive impact on the well-being of young people than older and middle-aged individuals [5]. Notably, studies focusing on youth have incorporated social capital variables and found that Internet use enhances social trust, social support, and subjective well-being [6,7].

Regarding the mechanisms underlying the impact of Internet use on the well-being of rural residents, several studies have indicated that Internet use contributes to improved economic conditions among farmers, with higher usage frequency correlating with greater well-being [8,9]. Furthermore, research distinguishes between productive and lifestyle Internet use, revealing that the latter yields more significant well-being benefits [10]. The Internet's information dissemination channels, search functions, e-learning platforms, and leisure and entertainment opportunities are also identified as sources that enhance the well-being of rural residents [11,12]. While numerous studies have individually explored the roles of Internet use and social capital in relation to individual well-being, few have examined their combined influence on the well-being of rural residents.

Thus, it is imperative to investigate the impact and mechanisms through which the Internet affects the well-being of rural residents, taking into account their subjective experiences. Although there is a substantial body of literature exploring the relationship between Internet use and rural residents, further refinement and expansion of the discussion on its impact on well-being are needed. In this study, we will focus on mobile phone access as an example to complement existing research on the influence of the Internet on the well-being of rural residents. The main contributions of this paper lie in two aspects. Firstly, we target a relatively underserved group, rural residents, to explore the impact of Internet use on their well-being, elucidating the pathways through which Internet use affects their overall well-being. Secondly, we investigate the mediating role of social capital in examining the impact of Internet use on the well-being of this group.

## 2. Theoretical Analysis and Research Hypotheses

Social capital is a multidisciplinary area of research that has received widespread attention, and important advances have been made in its theory and development. In terms of the definition and classification of social capital, social capital was first introduced by Putnam (1993) [13], who defined it as trust, reciprocity, and cooperative relationships in social networks. Subsequent researchers have classified social capital according to different perspectives and disciplinary backgrounds. Grootaert and Van Bastelar (2002) [14] have argued that social capital can be classified into family social capital, relative income, and subjective well-being. NaNahapiet and Ghoshal (1998) [15] classified it into structural and cognitive social capital, while Brown (1997) [16] classified it into micro, meso, and macro levels. Adler and Kwon (2002) [17] added a meso social capital that takes into account both internal and external aspects based on Potts' division of internal and external social capital.

In terms of social capital research methods, researchers have used a variety of methods to measure and understand social capital, including social capital questionnaires, social network analysis, and participant observation. These methods help researchers to measure and analyze different aspects of social capital to better understand its impact on individuals and

society. In terms of the impact of social capital, the impact of social capital on individuals and society is a core component of social capital research. Social capital can promote social cooperation, trust, and reciprocal relationships, which can have a positive impact on economic growth, political participation, and social cohesion. In addition, social capital is also closely related to an individual's well-being, health status, and educational opportunities. In terms of trends in social capital, social capital research has evolved in response to social change and technological development. Recent research trends include multi-level analysis of social capital, cross-country comparisons, and studies of regional differences, as well as refinement of social capital measurement tools and assessment systems. Taken together, the study and development of social capital is a multidisciplinary field, and through different perspectives and approaches, we can better understand the impact of social capital on individuals and society. Future research can further explore the mechanisms and effects of social capital, and how it can be used to promote the development of society and the well-being of individuals.

Well-being as a multidimensional concept has been the subject of extensive academic attention and research. In 1980, Andrews and McKennell proposed a measure of the components of well-being, dividing them into emotional, cognitive, and other components, and highlighting the complexity of well-being [18]. This laid the foundation for subsequent research on well-being. Subsequently, Diener further explored the concept and theory of well-being in 2000 and proposed a scientific definition of subjective well-being. He suggested the use of subjective well-being to measure how satisfied individuals are with their lives and proposed a method for constructing a national happiness index. These studies have provided important theoretical support for the measurement of happiness and policy formulation [19]. In fact, in order to measure individuals' satisfaction with their lives, Diener et al. developed the famous Life Satisfaction Scale in 1985. This scale has become a common tool for assessing individual well-being, enabling an objective assessment of individuals' satisfaction with their lives, and has been used in a large number of studies [20]. In fact, as early as the 1950s, Havighurst and Tobin proposed a measure of life satisfaction and regarded it as an important indicator of well-being. Their review of measures and indicators of well-being provided insights for subsequent research [21]. In 1981, Carley conducted a study on the measurement of subjective well-being and made some suggestions on the measurement of social well-being and the construction of social indicators. These studies emphasized the importance of well-being research in social policy and theory [22].

In summary, the theory and development of well-being covers research on the measurement of its components, the definition of subjective well-being, and the measurement tools for well-being. Through these studies, we can better understand and assess individuals' satisfaction and happiness with their lives and provide a scientific basis for the development of relevant policies. More importantly, the research on subjective well-being also provides strong theoretical support for this paper, and future research can further explore in depth the influencing factors of well-being and the relationship between well-being and other variables, in order to promote further research development in the field of well-being.

With the development of an information-based society, more and more scholars are focusing on the impact of Internet use on well-being. Numerous studies have found that the use of mobile phones, computers, and other technological products has significantly improved people's lives. The virtual world brought about by the Internet has not only enriched people's entertainment life but also opened up their eyes and expanded their access to learning. The Internet has provided online consumption and online income [23] and has broadened the income sources of rural residents, thus enhancing their sense of well-being.

The ways in which Internet use affects the happiness of rural residents are that, firstly, Internet use can help residents in rural areas to increase their income, which in turn has a positive impact on happiness. At the same time, the Internet provides more economic

opportunities and information resources that help rural residents improve their quality of life [24]. Secondly, the popularity of the Internet has enabled rural residents to access more information and social opportunities, increasing social participation and satisfaction, which in turn enhances well-being [25]. In addition, the functions of the Internet, including access to information, leisure, and entertainment, can increase residents' well-being. Third, Internet use can enhance people's well-being by satisfying individual communication needs and promoting social and recreational activities [26]. Taken together, the Internet not only provides rural residents with greater economic opportunities and information resources, but also satisfies their communication and entertainment needs and enhances well-being.

Therefore, we propose Hypothesis 1:

**H1.** *Internet use can positively affect the well-being of rural residents.*

Helliwell (2003) [27] argues that social trust, as an important component of social capital, can significantly enhance residents' well-being. Some domestic scholars point out that social capital plays a significant positive role in residents' subjective well-being, and that higher social capital can bring positive effects to people's mind and body, therefore leading to an increase in people's well-being [28]. Xu Yanhui et al. (2018) [27] similarly argued that social capital can help low-income residents on both the spiritual and material levels, thus enhancing their happiness.

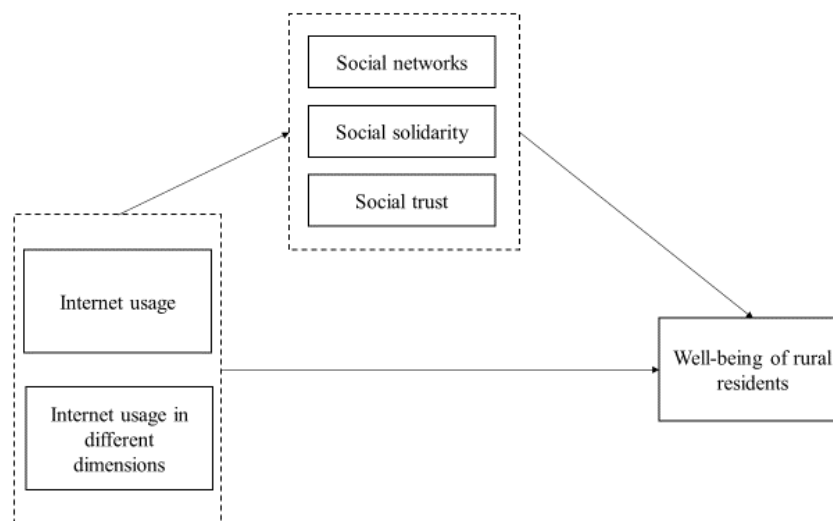
Social capital has a positive impact on the well-being of rural residents. Different forms of social capital have different effects on individuals' subjective well-being, with household social capital and relative income being associated with subjective well-being [29]. There is also an empirical relationship between income disparity and social capital and well-being, with the effect of income disparity on well-being likely to arise from the mediating role of social capital [30]. It has been shown that a decline in social capital has a negative impact on the happiness of residents [31], which showed that between 1975 and 2004, Americans' happiness was mainly influenced by an increase in income, while there was a negative correlation with social capital. This study reveals a link between the happiness of the population and social capital. In addition, a study by Francesco (2009) compared the relationship between social capital and subjective well-being in 11 Western European countries [32]. The findings support a positive relationship between social capital and well-being. This study further reinforces the importance of household social capital and relative income on the well-being of rural residents.

In summary, the existing literature suggests to some extent that social capital has a positive impact on the well-being of rural residents. Social capital includes aspects such as family social capital and relative income, and these factors can increase the happiness of rural residents. However, further research is also needed to gain a deeper understanding of the mechanisms and influencing factors of social capital on the happiness of rural residents. We therefore propose Hypothesis 2:

**H2.** *Social capital can have an impact on the happiness of rural residents.*

The Internet is also a new type of social capital that has a huge impact on the way of life of rural residents. The Internet has broken down the spatial barriers between rural residents and the outside world, and has also brought them closer to the outside world. The use of the Internet has enabled rural residents to build their own networks of relationships with the outside world in social networks where they can talk about their feelings, express their opinions, improve their skills, and engage in political monitoring. It also plays an increasingly important role in the many factors that influence the well-being of rural residents. Social capital can be found in relationships with relatives and friends, in work environments, churches or civic associations, or even in 'virtual communities' on the Internet [33]. Rural residents' use of the Internet can broaden their horizons, build intimate relationships with the outside world, and enhance their employment opportunities, thereby contributing to increased trust in society and their subjective sense of personal well-being.

Social networks and social trust as individual social capital affect rural residents' judgments about the outside world and their sense of social belonging, further influencing well-being (as shown in Figure 1).



**Figure 1.** Pathways by which Internet use affects the well-being of rural residents.

Social capital refers to the resources that individuals and groups gain through social networks that can be used to achieve common goals and improve well-being. With the spread of the Internet in rural areas of China, the use of the Internet by rural residents is becoming more widespread. It is therefore necessary to explore the relationship between social capital in relation to Internet use and subjective well-being, especially in rural areas where social capital is particularly important. Studies have shown that social capital partially mediates the relationship between Internet use and subjective well-being, suggesting that Internet use can enhance social capital and thus subjective well-being [34]. In China, scholars have also used a triple mediation approach to analyze the relationship between Internet use, social capital, and subjective well-being, finding that social capital partially mediates the relationship between Internet use and subjective well-being, and that Internet use also indirectly affects subjective well-being through its effect on social capital [35].

Social capital partially mediates the relationship between social networking service use and subjective well-being, with social networking services enhancing social capital and thus subjective well-being [36]. In a study of the relationship between Internet use and well-being among older adults in the United States, social capital partially mediated the relationship between Internet use and well-being, with Internet use enhancing social capital and thereby increasing older adults' well-being [37]. Finally, Guo and Feng (2018) [38] examined the relationship between Internet use, social capital, and social integration in rural China. They found that online social capital mediated the relationship between Internet use and social integration, and that social integration partially mediated the relationship between online social capital and subjective well-being.

Overall, social capital plays an important mediating role between Internet use and subjective well-being, especially in rural areas where social capital may be particularly important. Internet use enhances social capital, which in turn increases subjective well-being.

Therefore, we propose the following hypothesis:

**H3.** *Social capital is a mediating variable in the way that Internet use affects the well-being of rural residents.*

### 3. Research Design and Model Construction

#### 3.1. Data Sources

China Family Panel Studies (CFPS) is a nationwide, comprehensive social tracking survey project in China, which aims to reflect the social, economic, demographic, educational, and health changes in China by tracking and collecting data at the individual, household, and community levels, and to provide a data base for academic research and public policy analysis. Preliminary work began in 2007, with initial and follow-up pre-surveys of a total of 2400 households in Beijing, Shanghai, and Guangdong in 2008 and 2009. 2010 saw the official implementation of the CFPS baseline survey in 25 provinces/municipalities/autonomous regions across China; follow-up surveys were conducted nationwide in 2012, 2014, and 2016.

The initial target sample size of the CFPS was 16,000 households, of which 8000 were oversampled from the five separate sub-sample frames (known as ‘large provinces’) of Shanghai, Liaoning, Henan, Gansu, and Guangdong, with 1600 households in each ‘large province’. Each “large province” had 1600 households. A further 8000 households were drawn from a separate sub-sample frame (known as a ‘small province’) comprising a total of 20 other provinces. A final total of 14,960 households, 33,600 adults, and 8990 children were interviewed. The main questionnaire of CFPS consisted of a village questionnaire, a household questionnaire, a family questionnaire, a child questionnaire, and an adult questionnaire. The survey was conducted at three levels: community, household, and individual. At the community level, CFPS conducted an overall interview with each village/household through the village questionnaire, focusing on information about the village/household’s infrastructure, demographics, policy implementation, economic situation, social services, etc. For each household interviewed, both household- and individual-level interviews were conducted. The CFPS survey data are conditionally open and can be downloaded by registering at the Open Research Data Platform of Peking University (<https://opendata.pku.edu.cn/>) (accessed on 20 July 2022). There are no human subjects in this article and informed consent is not applicable.

The data used in this study are derived from the 2016 China Family Panel Studies (CFPS) conducted by Peking University. The CFPS dataset encompasses a comprehensive range of data, including information on individuals, families, and communities from 25 provinces, municipalities, and autonomous regions. Since 2010, this longitudinal survey has diligently followed 16,000 households, collecting data through questionnaires administered to children, adults, families, and communities. The selection of CFPS 2016 data for this study was primarily based on its extensive coverage of rural residents, enabling a more comprehensive and detailed examination of their Internet usage and social capital. To ensure data validity, irrelevant variables were excluded, and missing variables were addressed, resulting in a valid sample of 20,355 individuals.

#### 3.2. Variable and Descriptive Statistics

##### 3.2.1. Variable Selection

###### (1) Explanatory variables

With reference to the previous literatures, a Kert scale design was adopted for measuring the happiness of rural residents to objectively and scientifically measure the interviewees’ evaluation of their own happiness [7]. Participants were asked to rate their well-being on a scale ranging from “very unhappy” to “very happy”, represented numerically from 1 to 10.

###### (2) Core explanatory variables

The core explanatory variables in this study fall into two main categories. Firstly, Internet usage is categorized as either “use” or “non-use”, with a further breakdown of purposes for Internet use. Secondly, the social capital of rural residents is measured by indicators such as social networks, social trust, and social solidarity. For instance, the variable “whether to chat with strangers” replaces social network, and “whether to trust or

doubt others” substitutes for social trust. Social solidarity is represented by the variable “neighbours help”. Table 1 provides a detailed explanation of these variables, including their respective meanings and assigned values.

**Table 1.** Definition of variables and descriptive statistics.

Variable	Code	Variable Definition and Assignment	Min	Max	Mean	S.D.
Well-being	y	Well-being score (very unhappy—1–2–3–4–5–6–7–8–9–10—very happy)	1	10	5.05	0.47
Internet usage	x11	Mobile Internet access or lack of it (1 = yes; 0 = no)	0	1	0.46	0.49
Internet social frequency	x13	Frequency of social use of the Internet (e.g., chatting, tweeting, etc.) (1 = never; 2 = once every few months; 3 = once a month; 4 = 2–3 times a month; 5 = 1–2 times a week; 6 = 3–4 times a week; 7 = almost every day) (times)	1	7	5.86	1.88
Internet entertainment Frequency	x14	Frequency of using the Internet for entertainment (e.g., watching videos, downloading songs, etc.) (1 = never; 2 = once every few months; 3 = once a month; 4 = 2–3 times a month; 5 = 1–2 times a week; 6 = 3–4 times a week; 7 = almost every day) (times)	1	7	5.34	2.07
Internet business activities Frequency	x15	Frequency of conducting Internet business activities (e.g., use of internet banking, online shopping) (1 = never; 2 = once every few months; 3 = once a month; 4 = 2–3 times a month; 5 = 1–2 times a week; 6 = 3–4 times a week; 7 = almost every day) (times)	1	7	2.66	1.86
Social networks	x22	Do you chat with strangers (0 = no; 1 = sometimes; 2 = often)	0	2	0.25	0.47
Social solidarity	x23	Neighborhood help (1 = definitely no; 2 = probably no; 3 = can't say; 4 = probably yes; 5 = definitely yes)	1	5	4.48	0.82
Social trust	x24	Prefer to trust or suspect people (0 = be as careful as possible; 1 = most people can be trusted)	0	1	0.55	0.49
Gender	gen	Gender (1 = male; 0 = female)	0	1	0.49	0.50
Age	age	Age (continuous variable)	16	98	45.49	16.65
Education	edu	(edu) Highest level of education at last survey (1 = illiterate/semi-literate; 2 = elementary; 3 = junior high; 4 = high school; 5 = college; 6 = bachelor's degree; 7 = master's degree)	1	7	2.26	1.14
Political affiliation	plo	Political affiliation (0 = other; 1 = party member)	0	1	0.05	0.23
Health status	phy	Health status (1 = unhealthy; 2 = fair; 3 = fairly; healthy; 4 = very healthy; 5 = very healthy)	1	5	2.97	1.25
Marital status	marry	Current marital status (0 = unmarried; 1 = married)	0	1	0.85	0.35

### (3) Control variables

The control variables selected for this study are derived from the individual characteristics of the respondents. These variables include “gender”, “age”, “education”, “political affiliation”, “social support”, “health status”, and “current marital status”.

#### 3.2.2. Sources of Variables

Well-being is widely regarded as the ultimate goal in most individuals' lives [39]. The Internet significantly enhances people's well-being by fulfilling their needs for information access, communication, work, and entertainment [40]. Considering the increasing prevalence of Internet usage, the focus shifts from the mere presence of Internet access to examining the actual usage patterns [41]. Social capital, recognized as a crucial factor influencing subjective well-being, encompasses social networks, social trust, and social mutual help, all of which play pivotal roles in resolving challenges faced by rural residents and contribute to their subjective well-being [42,43]. Refer to Table 1 for a comprehensive list of variable definitions.

### 3.2.3. Descriptive Statistics

The descriptive statistics for this study are presented in Table 1, providing valuable insights into the variables under investigation. The sample indicates that the overall well-being of rural residents was reported to be at a moderate level, with an average score of 5.05. It is noteworthy that 46% of rural residents utilize mobile phones for Internet access, reflecting a relatively low proportion. In terms of Internet usage frequency, rural residents primarily engage in social and entertainment activities, dedicating an average of 5.86 and 5.34 h per week, respectively, while allocating comparatively less time to business-related activities, with an average of 2.66 h.

Turning to social capital indicators, the mean score for social network was recorded as 0.25, suggesting that rural residents tend to engage in fewer conversations with strangers within their social networks. On the other hand, the mean score for social mutual help was relatively high at 4.48, indicating that a majority of rural residents believe in the likelihood of receiving assistance when needed. As for social trust, the average score stands at 0.55, signifying a medium level of trust among rural residents.

Examining personal characteristics, the sample composition reveals that 49% of participants identified as male, slightly lower than the proportion of females within the sample. The mean age of the participants was calculated to be 45.49 years, while the average level of education was reported as 2.26. Among the sample, 5% of individuals were affiliated with political parties, and the mean health condition score was 2.97. Furthermore, the analysis indicates that 85% of the participants were married, suggesting a higher representation of married individuals among the rural residents in the sample. These findings imply that the sampled rural residents generally exhibit lower levels of education, a lower party membership rate, moderate health conditions, and a higher prevalence of marriage.

### 3.3. Model Construction

This article employs a multivariate ordered logistic model to analyze the impact of explanatory variables, which are multicategorical and ordered. The model is specified as follows:

$$Y_i = \beta_0 + \beta_{1i}X_1 + \beta_{2i}X_2 + \beta_{3i}X_3 + \dots + \beta_{ni}X_n + \mu_i \quad (1)$$

In Equation (1), the variable  $i$  represents the life satisfaction of rural residents, ranging from 1 to 10. The coefficient vectors are denoted by  $\beta$ , and  $\mu$  represents the random error term. To thoroughly examine the variations in well-being among rural residents, the study utilizes a stepwise regression method to incrementally include explanatory and control variables in the model analysis. Furthermore, the robustness of the model is ensured by comparing the results obtained through different model specifications.

In order to address potential heteroskedasticity effects on the model results, robust standard errors were employed during the econometric analysis. The software Stata 16.0 was utilized to implement the aforementioned econometric models. This approach helps to mitigate biases and enhances the reliability of the findings.

## 4. Empirical Analysis Results

The sample data were processed using the Ologit regression technique in Stata 16.0 statistical software. The regression results are presented in three distinct steps to examine the various factors influencing the well-being of rural residents.

In the first step, Table 2 displays the results pertaining to the impact of mobile phone usage and Internet usage on the well-being of rural residents. Moving on to the second step, Table 3 presents the results exploring the influence of social capital on the well-being of rural residents. In the third step, the study investigates the influence of Internet usage and usage routes on the well-being of rural residents while considering the mediating effect of social capital. This analysis is presented in Tables 4–7, which provide a comprehensive understanding of how different aspects of Internet usage, mediated by social capital, impact the well-being of rural communities.



**Table 2.** Regression results of the effect of Ologit mobile phone use and Internet usage on the well-being of rural residents.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
x11	0.395 ** (0.103)				0.396 *** (0.110)			
x13		0.095 *** (0.030)				0.069 * (0.036)		
x14			0.108 *** (0.026)				0.057 * (0.031)	
x15				0.158 *** (0.024)				0.143 *** (0.029)
gen					−0.044 (0.109)	−0.042 (0.108)	−0.047 (0.109)	−0.006 (0.109)
age					−0.214 *** (0.023)	−0.209 *** (0.023)	−0.207 *** (0.023)	−0.214 *** (0.023)
age <sup>2</sup>					0.001 *** (0.000)	0.001 *** (0.000)	0.001 *** (0.000)	0.000 *** (0.000)
edu					−0.149 *** (0.041)	−0.156 *** (0.043)	−0.155 *** (0.043)	−0.204 *** (0.044)
plolicy					0.186 (0.143)	0.192 (0.244)	0.189 (0.245)	0.179 (0.243)
phy					0.107 ** (0.052)	0.100 *** (0.052)	0.101 * (0.052)	0.097 * (0.052)
marry					−1.134 *** (0.252)	−1.127 *** (0.251)	−1.130 *** (0.251)	−1.067 *** (0.251)
Wald chi2(11)	14.71 ***	9.70 ***	17.47 ***	43.45 ***	1615.82 ***	1630.01 ***	1645.04 ***	1580.16 ***
R <sup>2</sup>	0.002	0.002	0.003	0.007	0.208	0.206	0.206	0.210
N	20,355	20,355	20,355	20,355	20,355	20,355	20,355	20,355
Log-likelihood	−2601.8499	−2604.1047	−2600.9432	−2590.9333	−2066.2919	−2070.8391	−2071.2182	−2061.3213

Note: \*\*\*, \*\*, and \* are significant at the levels of 1%, 5%, and 10%, respectively.

**Table 3.** Regression results of the effect of social capital on the well-being of rural residents.

	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
x22	0.280 *** (0.099)			0.221 ** (0.107)		
x23		−0.246 *** (0.048)			−0.121 * (0.063)	
x24			0.292 *** (0.105)			0.221 ** (0.106)
gen				−0.037 (0.108)	−0.244 (0.105)	−0.013 (0.106)
age				−0.212 *** (0.023)		
age <sup>2</sup>				0.001 *** (0.000)		
edu				−0.141 *** (0.041)	−0.232 *** (0.035)	−0.061 * (0.035)
plolicy				0.179 (0.245)	0.118 (0.234)	0.126 (0.235)
phy				0.103 ** (0.052)	0.287 *** (0.046)	0.509 *** (0.038)
marry				−1.137 *** (0.251)	−3.203 *** (0.154)	
Wald chi2(11)	7.90 ***	25.39 ***	7.71 ***	−1.137 ***	634.69 ***	190.76 ***
R <sup>2</sup>	0.001	0.003	0.001	0.206	0.170	0.028
N	20,355	20,355	20,355	20,355	20,355	20,355
Log-likelihood	−2605.4345	−2599.4435	−2605.3814	−2070.825	−2164.5319	−2535.3934

Note: \*\*\*, \*\*, and \* are significant at the levels of 1%, 5%, and 10%, respectively.

**Table 4.** Regression results of the effect of mobile phone access and social capital on the well-being of rural residents.

	Model 15	Model16	Model 17	Model 18	Model 19	Model 20	Model 21
Dependent variable	y	x22	y	x23	y	x24	y
x11	0.396 *** (0.110)	0.211 *** (0.033)	0.385 *** (0.103)	−0.090 *** (0.028)	0.358 *** (0.103)	−0.070 ** (0.028)	0.399 *** (0.103)
x22			0.265 *** (0.100)				
x23					−0.242 *** (0.049)		
x24							0.297 *** (0.105)
CV	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald chi2	1615.82 ***	182.00 ***	1601.82 ***	869.77 ***	1601.48 ***	442.99 *	1601.22 ***
R <sup>2</sup>	0.208	0.007	0.208	0.021	0.208	0.016	0.208
N	20,355	20,355	20,355	20,355	20,355	20,355	20,355
Log-likelihood	−2066.2919	−12,291.701	−2064.5205	−19,147.098	−2065.1738	−13,755.757	−2065.8553

Note: \*\*\*, \*\*, and \* are significant at the levels of 1%, 5%, and 10%, respectively.

**Table 5.** Use of mobile phones for social interaction and social capital on the well-being of rural residents.

	Model 22	Model 23	Model 24	Model 25	Model 26	Model 27	Model 28
Dependent variable	y	x22	y	x23	y	x24	y
x13	0.069 * (0.036)	0.181 *** (0.011)	0.063 * (0.036)	0.057 *** (0.007)	0.099 *** (0.030)	−0.016 ** (0.007)	0.095 *** (0.030)
x22			0.202 * (0.108)				
x23					−0.252 *** (0.048)		
x24							0.291 *** (0.105)
CV	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LR chi2(1)	1630.01 ***	404.00 ***	1617.56 ***	912.53 ***	1620.30 ***	441.17 ***	1615.03 ***
R <sup>2</sup>	0.206	0.018	0.207	0.022	0.206	0.016	0.206
N	20,355	20,355	20,355	20,355	20,355	20,355	20,355
Log-likelihood	−2070.8391	−12,148.405	−2069.0317	−19,123.499	−2069.695	−13,756.392	−2070.362

Note: \*\*\*, \*\*, and \* are significant at the levels of 1%, 5%, and 10%, respectively.

**Table 6.** Use of mobile phones for entertainment and social capital on the well-being of rural residents.

	Model 29	Model 30	Model 31	Model 32	Model 33	Model 34	Model 35
Dependent variable	y	x22	y	x23	y	x24	y
x14	0.057 * (0.031)	−0.020 *** (0.007)	0.051 *** (0.031)	0.052 *** (0.007)	0.112 *** (0.026)	−0.020 *** (0.007)	0.109 *** (0.026)
x22			0.203 *** (0.109)				
x23					−0.254 *** (0.048)		
x24							0.292 *** (0.105)
CV	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LR chi2(1)	1645.04 ***	444.59 ***	1630.37 ***	911.01 ***	1634.79 ***	444.59 ***	157.60 ***
R <sup>2</sup>	0.206	0.016	0.206	0.022	0.206	0.016	0.002
N	20,355	20,355	20,355	20,355	20,355	20,355	20,355
Log-likelihood	−2071.2182	−13,754.336	−2069.3974	−19,124.269	−2070.0963	−13,754.336	−28,956.639

Note: \*\*\* and \* are significant at the levels of 1% and 10%, respectively.

**Table 7.** Use of mobile phones for business activities and social capital on the well-being of rural residents.

	Model 36	Model 37	Model 38	Model 39	Model 40	Model 41	Model 42
Dependent variable	y	x22	y	x23	y	x24	y
x15	−0.029 *** (0.006)	0.361 *** (0.009)	0.136 *** (0.030)	−0.013 * (0.007)	0.156 *** (0.024)	−0.025 *** (0.007)	0.158 *** (0.024)
x22			0.132 (0.113)				
x23					−0.241 *** (0.049)		
x24							0.291 *** (0.105)
CV	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LR chi2(1)	18.98 ***	1561.10 ***	1571.41 ***	863.68 ***	1568.93 ***	446.29 ***	1567.06 ***
R <sup>2</sup>	0.000	0.071	0.210	0.021	0.210	0.016	0.210
N	20,355	20,355	20,355	20,355	20,355	20,355	20,355
Log-likelihood	−29,025.945	−11,502.148	−2060.5693	−19,151.893	−2060.3253	−13,753.392	−2060.8519

Note: \*\*\* and \* are significant at the levels of 1% and 10%, respectively.

By presenting the regression results in these three sequential steps, the study enables a detailed examination of the individual and combined effects of mobile phone use, social capital, and Internet usage on the well-being of rural residents. These findings contribute to the understanding of the complex relationships between these variables and their implications for rural community well-being.

#### 4.1. Results on the Effect of Mobile Phone Use and Internet Usage on the Well-Being of Rural Residents

Models 1 to 4 were designed to control for core explanatory variables, while models 4 to 8 introduced additional control variables to models 1 to 4. The results obtained from models 1 to 8 indicate a significant and positive effect of mobile phone Internet access and mobile phone usage on the well-being of rural residents, with statistical significance levels of 10% and 1%, respectively. This finding can be attributed to the fact that the Internet has become increasingly popular among disadvantaged groups with lower socio-economic status in China, allowing rural residents to bypass basic Internet access and directly access higher-level Internet services through mobile phones. This convenience contributes to the positive impact of mobile phone Internet usage on the well-being of rural residents. This finding aligns with the research conducted by Lu, H., and Kandilov, I. T. (2021) [44], who discovered that Internet usage has broadened the horizons of rural residents and narrowed the “digital divide” between them and other “advantaged groups” with greater access to social resources.

The study also reveals a significant and positive effect of mobile phone usage for social, entertainment, and business activities on the well-being of rural residents, with a statistical significance level of 1%. This result can be attributed to the widespread use of the Internet, which has enriched the online consumption, information access, leisure activities, and employment opportunities of rural residents. These factors contribute to an enhanced sense of well-being. This finding is consistent with the research conducted by Yang et al. (2023) [45], who found that the Internet, as a form of “capital accumulation”, enhances the psychological satisfaction and self-identity of rural residents by expanding their knowledge and enriching their lives, ultimately increasing their overall well-being.

Among the control variables, models 5 to 8 demonstrate a significant and negative effect of both age and educational attainment on the well-being of rural residents, with a statistical significance level of 1%. This suggests that highly educated and older rural residents perceive lower levels of well-being. This phenomenon may be attributed to the trend of young individuals moving to cities, resulting in an aging population and the prevalence of “empty villages” in rural areas. The increased loneliness experienced by rural residents could contribute to a decrease in their well-being. The marital status of

rural residents also exerts a significant negative effect on their well-being, with all levels of significance at 1%. Unmarried rural residents reported higher levels of well-being compared to those with other marital statuses. This could be attributed to the reduced family and childcare responsibilities experienced by unmarried individuals, resulting in lower levels of stress and, consequently, a greater sense of well-being.

Furthermore, the health status of rural residents demonstrates a significant positive effect on their well-being, with a statistical significance level of 5%. The findings indicate that individuals in better health experience higher levels of well-being. Good health provides individuals with abundant energy and a positive state of mind, contributing to enhanced subjective well-being.

#### 4.2. Results of the Impact of Social Capital on the Well-Being of Rural Residents

Models 9 and 12 yield significant findings regarding the impact of social networks on the well-being of rural residents. The results indicate a significant positive effect, with statistical significance levels of 1% and 5%, respectively. This outcome can be attributed to the fact that engaging in conversations with strangers not only fosters new friendships, thereby enhancing one's social capital, but also contributes to a stronger sense of social identity. These findings align with the research conducted by Utz, S (2015) [46], which demonstrated that social networks can improve residents' well-being by enhancing social connections.

On the other hand, Models 10 and 13 present significant and negative effects of social solidarity on the well-being of rural residents, with a statistical significance level of 1%. The possible explanation for this discrepancy lies in the fact that rural residents tend to seek help from their neighbors primarily when faced with challenging problems in their daily lives. These difficulties not only reduce their overall well-being but also create a sense of indebtedness, further diminishing their well-being.

Regarding social trust, Models 11 and 14 reveal a significant positive effect on the well-being of rural residents, with a statistical significance level of 1%. This outcome can be attributed to the fact that trust in strangers fosters social harmony within the social lives of rural residents, thereby enhancing subjective well-being. Reasonable levels of trust contribute to an individual's sense of living well, promoting psychological well-being and increasing overall life satisfaction. However, excessive trust carries the risk of disappointment, which can be detrimental to one's psychological well-being, ultimately reducing overall well-being.

#### 4.3. The Mediating Effect of Social Capital

##### 4.3.1. Mediating Effects of Mobile Phone Access and Social Capital

Table 4 presents the regression results examining the effects of mobile phone Internet access and social capital on the well-being of rural residents. To assess and draw conclusions about the mediating effects, we conducted stepwise regression analysis, as outlined in Table 4. In Model 16, the findings reveal a significant positive effect of mobile phone Internet access on social networks, with statistical significance at the 1% level. Conversely, Models 18 and 20 demonstrate a significant negative effect of mobile phone Internet access on both social solidarity and social trust, also at the 1% statistical level. Model 21 indicates that social networks and social trust positively influence the well-being of rural residents, with statistical significance at the 1% level. Conversely, social solidarity exhibits a significant negative effect on the well-being of rural residents, again at the 1% statistical level. These results suggest that the impact of mobile phone access on the well-being of rural residents is partially mediated by social capital as a mediating variable.

The findings highlight that mobile phone access significantly and positively affects the well-being of rural residents when mediated by social networks, social solidarity, and social trust, with statistical significance at the 1% level. This indicates that social capital, as a mediating variable, plays a partial role in influencing the pathway between mobile phone access and well-being.

#### 4.3.2. The Mediating Effect of Mobile Phone Usage Use and Social Capital

Table 5 presents the regression results examining the effects of using mobile phones for social interaction and social capital on the well-being of rural residents. Similarly, Table 6 showcases the results of the regression between the use of mobile phones for entertainment and social capital, while Table 7 displays the results of the regression between the use of mobile phones for business and social capital on the well-being of rural residents.

In Model 28, when social networks are used as an intermediary path within social capital, the findings reveal that using mobile phones for both social and commercial activities has a significant positive effect on social networks. Conversely, using mobile phones for entertainment shows a significant negative effect on social networks, with statistical significance at the 1% level. Notably, Tables 5 and 6 demonstrate that social networks have a significant positive effect on the well-being of rural residents, while Table 7 does not exhibit a significant effect. Models 24, 31, and 38 incorporate social networks as a mediating variable, revealing that the use of mobile phones for social, recreational, and business activities all have a significant positive effect on the life satisfaction of rural residents, with statistical significance at the 10% and 1% levels. These results suggest that the impact of different uses of mobile phones on the well-being of rural residents is at least partially mediated by the variable of social networks within social capital.

When social solidarity was considered as an intermediary path within social capital, the analysis results are presented in Tables 5–7. Model 25 and Model 32 indicate that using mobile phones for social and recreational purposes has a significant positive effect on social solidarity, with statistical significance at the 1% level. Conversely, Model 39 demonstrates that the use of mobile phones for business activities has a significant negative effect on social solidarity, with statistical significance at the 10% level. Additionally, Model 26 reveals that social solidarity has a significant negative effect on the well-being of rural residents, with statistical significance at the 1% level. Incorporating social solidarity as a mediating variable, Models 26, 33, and 40 highlight that the use of mobile phones for social, recreational, and business activities all have a significant positive effect on the well-being of rural residents, with statistical significance at the 1% level. These findings suggest that at least part of the effect of different mobile phone uses on the well-being of rural residents is mediated by the variable of social solidarity within social capital.

Furthermore, when social trust within social capital is utilized as an intermediary path, the analysis results are displayed in Tables 5–7. Models 27, 34, and 41 indicate that the use of mobile phones for social, recreational, and business activities all have a significant negative effect on social trust, with statistical significance at the 1% level. Notably, social trust demonstrates a significant positive effect on the life satisfaction of rural residents, with statistical significance at the 1% level. Incorporating social trust as a mediating variable, models 28, 35, and 42 reveal that the use of mobile phones for social, recreational, and business activities all have a significant positive effect on the life satisfaction of rural residents, with statistical significance at the 1% level. These findings suggest that at least part of the effect of different uses of mobile phones on the well-being of rural residents is mediated by the variable of social trust within social capital.

## 5. Discussion

This study aimed to investigate the influence of different Internet uses on the well-being of rural residents. Utilizing data from the Chinese Family Panel Studies (CFPS) conducted in 2016, we employed logistic models to empirically examine the effects of Internet use and social capital on the well-being of rural residents. Additionally, we tested the impact of Internet use on the well-being of rural residents when social capital was employed as an intermediary variable.

The findings revealed that Internet use has significantly widened the perspective of rural residents, bridging the “digital divide” with individuals who have access to greater social resources. As a result, Internet use positively impacts the well-being of rural residents. Furthermore, the study uncovered that social capital also plays a crucial role in determining

the well-being of rural residents. Specifically, we explored three dimensions of social capital: social network, social mutual assistance, and social trust. Our analysis demonstrated that both social network and social trust have a positive influence on the well-being of rural residents. However, social mutual assistance exhibited a notable negative impact on their well-being.

To delve further into the mechanisms through which Internet use influences the well-being of rural residents, we analyzed intermediary variables. The results indicated that mobile phone use, a prominent indicator of Internet use chosen for this study, exerts a significant positive influence on the well-being of rural residents. This influence operates through the three dimensions of social capital—social network, social mutual assistance, and social trust.

The contributions of this study are multifaceted and can be primarily observed in the following three dimensions. Firstly, while previous studies have explored the impact of Internet use on the well-being of rural residents through channels such as online learning and entertainment [47,48], we take a step further by categorizing Internet usage into social interaction, entertainment, and commercial activities. By doing so, we aim to comprehensively investigate the pathways through which Internet use affects the well-being of rural residents, thus providing a more nuanced understanding of its impact.

Secondly, unlike the majority of previous studies, our investigation of the impact of Internet use on the well-being of rural residents [49] takes into account three dimensions of social capital as intermediate variables: social network, social mutual assistance, and social trust. By incorporating these dimensions, this study takes an innovative approach to explore the mediating factors that underlie the relationship between Internet use and the well-being of rural residents. This novel examination allows for a clearer comprehension of the specific mechanisms through which social capital, as a mediating variable, can exert positive or negative impacts on well-being.

Thirdly, a notable contribution of this study lies in its novel exploration of how Internet use can ameliorate the “digital divide” experienced by rural residents. By examining the various uses of the Internet, such as socializing, entertainment, and business activities, this research sheds light on the diverse ways in which Internet access can bridge the gap between rural communities and more advantaged groups. This innovative perspective expands our understanding of the potential of technology to reduce inequalities and enhance the well-being of individuals living in rural areas.

Although this study has made significant contributions to our understanding of the relationship between Internet usage and the well-being of rural residents, there are still certain limitations that warrant further investigation.

Firstly, it is important to acknowledge that this study solely focused on data from the year 2016. Considering the dynamic nature of Internet usage and its impact on well-being, relying on data from a single year may provide a limited and static depiction of the phenomenon. Therefore, future research endeavors should aim to incorporate data spanning multiple years to provide a more comprehensive and longitudinal understanding of the effects of Internet use on the well-being of rural residents. By doing so, we can enhance the accuracy of the statistical results and gain a more realistic representation of the outcomes. Studies should consider using additional data sources to gain a more comprehensive understanding of the impact of Internet use on the well-being of rural residents. Meanwhile, as the current data are time-bound, it is our team’s future endeavor to actively and dynamically track a sample of those surveyed. In terms of empirical model, we will consider additional tools for empirical analysis in the future.

Secondly, although this study categorized rural residents’ Internet use behaviors into mobile Internet access and non-mobile Internet access, certain crucial details, such as the duration and expenses associated with rural residents’ mobile Internet usage, were not thoroughly discussed. Addressing these aspects will be a key direction for our research team in future investigations. By delving into the time spent and costs incurred in rural residents’ mobile Internet access, we can gain deeper insights into the nuanced dynamics

of Internet use and its impact on well-being. In addition, we only explored the impact of Internet use on the well-being of rural residents, but did not explore the impact of Internet use on other aspects of rural residents, such as education and employment. This is also our future research prospect.

Thirdly, it is worth noting that this study focused exclusively on rural residents as the research subjects within a specific contextual backdrop, without considering potential regional and cultural heterogeneities. To strengthen the validity and generalizability of our findings, future studies should replicate the research in diverse settings and backgrounds. By encompassing different regions and cultural contexts, we can ensure that our conclusions are more robust and applicable to a broader population. The research and methodological findings of this paper are not only applicable to rural areas in China, but may also be extended to other countries or regions for related research.

In summary, this study contributes to the exploration of the well-being of rural residents by examining the role of social capital as an intermediary variable in the relationship between Internet use and happiness. It complements previous research by dissecting social capital into three distinct dimensions: social network, social mutual assistance, and social trust. Ultimately, this research endeavor aids in promoting the overall well-being of rural residents and provides a foundation for future studies on the determinants of their well-being.

## 6. Conclusions and Policy Implications

### 6.1. Conclusions

From the perspective of mobile phone use, this study employs a combination of theoretical analysis and empirical tests to examine the influence of Internet use and social capital on the well-being of rural residents. Additionally, the study explores the impact of using mobile phones for social, recreational, and commercial activities on the well-being of rural residents through the mediating factors of social networks, social solidarity, and social trust. The following key conclusions have been derived:

First and foremost, the findings confirm that Internet use has a positive impact on the well-being of rural residents. By expanding their horizons and bridging the “digital divide” with more privileged groups that have access to greater social resources, Internet use enhances the well-being of rural residents. This conclusion validates Hypothesis H1.

Secondly, the study reveals that social capital significantly influences the well-being of rural residents. Specifically, social networks exhibit a substantial positive impact on the well-being of rural residents, while social solidarity demonstrates a noteworthy negative impact. Furthermore, social trust has a significant positive effect on the well-being of rural residents. These findings support Hypothesis H2.

Thirdly, through the mechanism test, the study establishes that mobile phone access exerts a positive and significant effect on the well-being of rural residents. This effect is mediated by the intermediary variables of social networks, social solidarity, and social trust, all of which demonstrate statistical significance at the 1% level. Importantly, the study confirms that social networks, social solidarity, and social trust within social capital act as intermediaries in the relationship between Internet use and the well-being of rural residents. Thus, Hypothesis H3 is upheld.

### 6.2. Policy Implications

- (1) Facilitate the Rural Internet Popularization and Enhance Communication Infrastructure: Urgent measures must be taken to improve rural communication facilities and promote the widespread adoption of the Internet in rural areas. This will help prevent the exacerbation of the information “wealth gap” and bridge the existing “digital divide”. By investing in communication infrastructure, policymakers can ensure equitable access to information and communication technologies across rural communities.

- (2) Foster Rural Residents' Initiative in Internet Usage: Encouraging rural residents to proactively engage with the Internet is crucial. The Internet offers not only leisure and stress-relief opportunities, but also easy and rapid access to a wealth of information. Recognizing rural residents as active agents in information activities, it is essential to promote the utilization of the Internet's information input function. This can be achieved by empowering rural residents to enhance their skills and knowledge through Internet usage. Additionally, establishing a wholesome and inspiring online environment is vital to collectively foster the healthy development of the Internet and its users.
- (3) Enhance Rural Residents' Social Capital and Cultivate a Positive Social Atmosphere: Efforts should be made to increase the social capital of rural residents and create a favorable social atmosphere in rural areas. Encouraging rural residents' participation in recreational activities organized by the government or village committees can foster interaction and communication among community members while elevating social trust levels. Public authorities should assume a central leadership role in people's lives, instituting credible social trust systems through institutional and legal frameworks. Reinforcing the importance of social trust in both personal and professional spheres should extend to the online realm, cautioning rural residents about potential risks associated with interacting with strangers on the Internet. These measures collectively aim to establish a nurturing online environment conducive to positive interactions.

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