The Impact of Internet Use on Perception of the Poor–Rich Gap: Empirical Evidence from China

Xiaofan Zuo 1 and Zhisheng Hong 2,*

1 College of Humanities and Development Studies, China Agricultural University, Beijing 100193, China; zuoxiaofan007@foxmail.com
2 Institute of Science and Development, Chinese Academy of Sciences, Beijing 100190, China
* Correspondence: hongzhisheng@casisd.cn

Abstract: The advancement of Internet technology has provided a great impetus to alleviate poverty and promote economic progress. However, studies on the negative impact that the development of the Internet may have on individual perceptions are still rare. This paper uses data from the China Family Panel Studies (CFPS) in 2018 to construct multiple econometric models to empirically study the impact of Internet use (ITU) on the perception of the poor–rich gap (PPRG) and its mechanism in China. The instrumental variable (IV) model and Heckman model are used to solve potential endogenous problems. The research found that ITU has aggravated the PPRG of residents, and the test results are still robust after considering various endogenous sources. Additional analysis shows that the degree of dependence on the Internet is one of the transmission mechanisms of ITU on the impact of the PPRG, and its mediating effect accounts for 32.12% of the total effect. Another test result of the impact mechanism shows that the Internet media expands the reference group of residents through virtual areas and aggravates the PPRG of residents. Some test results from the perspective of heterogeneity show that: the effect of urban residents’ ITU on PPRG is higher than that of rural residents. ITU of residents in economically developed areas has a significantly higher effect on the PPRG than residents in economically underdeveloped areas. The impact on ITU by residents of different age groups on aggravating the PPRG show an obvious increasing linear law. Our research provides an ITU interpretation path for the impact of PPRG from sociological theory and provides a new entry point for the impact of the Internet and subjective well-being.

Keywords: internet use; perception of the poor–rich gap; aggravating effect; subjective well-being; social equality; SDGs; China

1. Introduction

Transforming our World: The 2030 Agenda for Sustainable Development covers 17 sustainable development goals (SDGs). Among the SDGs, SDG 10 clearly stated that we should reduce inequality within countries, so as to deal with the problem of increasing income inequality within countries and provide impetus for sustainable development [1]. In the context of rapid economic development, subjective welfare plays an increasingly important role in creating objective welfare, people’s pursuit of well-being has changed from material to non-material. Individuals begin to pay more attention to subjective well-being rather than just the material standard of living. Numerous studies have shown that happiness is significantly reduced due to the widening poor–rich gap in the process of economic development [2–4]. The Internet, as technological innovation of great significance, has a potential impact on changes in income patterns and individual subjective perceptions [5–7]. In recent years, the Internet in countries represented by China has achieved rapid development. The Internet penetration rate has increased from 38.3% in 2011 to 70.4% in 2020 in China, and the number of Internet users has reached 989 million, of which the number of mobile Internet users is 986 million [8]. Mobile Internet has become an indispensable tool in
people’s lives. Therefore, in the context of daily life becoming more and more inseparable from the Internet, paying attention to the impact of Internet use (ITU) on the perception of the poor–rich gap (PRPG) is of significance for discussing the subjective well-being of individuals and realizing the promotion of social equality and sustainable development as proposed by SDGs.

Information and communication technology (ICTs) has provided an important driving force for the economic growth of developing countries by improving innovation capabilities and increasing labor productivity \[9,10\]. Although ICTs have positive effects on economic growth in both developed and developing countries, ICTs have a greater positive effect on low-income and middle-income economies \[11\]. However, another study showed that developing countries’ gains from ICT investment are significantly less than those of developed economies \[12\]. The impact of ICTs on inequality is also reflected in the differences between urban and rural areas. The development of ICTs may further widen the gap between developed and developing countries, but if the median and average income increase and poverty decrease, the increase in inequality can be tolerated to a certain extent \[13\]. However, studies have shown that the development of the Internet has a similar inverted “U-shaped” relationship to the urban–rural income gap. In the early stage of the development of the Internet, it was mainly considered that the use of the Internet in rural areas was weaker than that of urban residents, which widened the income gap between urban and rural areas. With the continuous popularization of the Internet, especially the development of the mobile Internet, the marginal effect of the Internet on the income growth of rural residents is higher than that of urban residents, which is conducive to narrowing the urban–rural income gap \[14,15\]. Therefore, at different stages of Internet development, the impact on the urban–rural gap is different, and this conclusion seems to apply to the Internet in developed and developing countries.

It is undeniable that the Internet has played an important role in alleviating poverty. The Internet alleviates the poverty of residents by improving the access to employment opportunities, financial accessibility, medical accessibility, education accessibility, and personal development capabilities \[16–19\]. A study shows that among ICTs indicators, ITU has the greatest impact on all poverty indicators. Promoting Internet penetration and expanding Internet access is important for poverty eradication \[20\]. Relevant studies in Mexico have confirmed that Internet access is an important mechanism for poverty reduction, but the poverty reduction effect of the Internet has different effects between rural and urban sectors, and the Internet poverty reduction effect in rural areas is more significant \[21\]. The development of the mobile Internet seems to provide greater positive effects for poverty reduction. Some research shows that mobile Internet coverage has a significant positive impact on household consumption and poverty reduction, policy formulation to promote investment in mobile Internet infrastructure can further promote poverty alleviation \[22,23\].

As a representative of digital technology, the Internet not only promotes economic development but also has positive significance for increasing human happiness \[24,25\]. For example, the Internet as a tool for social integration can accumulate social capital in the network to obtain new social support and obtain a happy experience from it \[26,27\], improving people’s self-esteem, sense of belonging, and citizenship through ITU \[28\]. However, it is undeniable that the development of the Internet has also brought some negative effects. Some studies in psychology and sociology have confirmed that the use of the Internet by individuals reduces the communication between individuals and family members, reduces personal social interaction circles, and brings emotional depression and loneliness \[29\]. Similar conclusions such as the detrimental effects of ITU on subjective well-being are also supported by other studies \[30–32\]. The negative impact of the improper use of the Internet has also received attention. Some studies have confirmed that Internet addiction can cause adolescents to decrease their self-esteem, decrease their satisfaction with life and increase the risk of depression, and have a negative impact on their mental health \[33,34\].
The existing literature has fully discussed the economic effects brought about by the Internet. The popularization of the Internet provides a driving force for economic growth and poverty eradication. Although some documents also point out that the Internet may increase inequality [13,35], the Internet is still conducive to inclusive development from a long-term perspective [36,37]. At the same time, the existing literature has confirmed that ITU has both positive and negative effects on subjective perception. However, the issue of the impact of ITU on PPRG or the perception of inequality is rarely discussed in the existing literature. Taking PPRG as the starting point, discussing the impact of the Internet on subjective perception is of positive significance for improving people’s livelihood policy formulation and subjective perception research.

This paper uses the microdata of China’s household survey to construct an econometric model based on theoretical analysis to empirically study the impact of ITU on PPRG and attempts to answer the following key questions: (1) Does ITU affect individual PPRG? (2) What is the mechanism by which ITU affects PPRG? (3) From the perspective of urban–rural differences, different regions, and different ages, what is the difference in the impact of ITU on PPRG?

Based on the existing literature, the contribution of this paper is reflected in the following three aspects. First, this paper is one of the first studies focusing on the impact of the ITU on PPRG. By discussing some of the negative effects of the Internet on individual perceptions, in the context of the rapid development of the Internet, the literature on the relationship between Internet technology and social development has been enriched. Second, when studying the impact of ITU on PPRG, this paper fully considers the possible endogenous problems in the process of model building. The instrumental variable (IV) method, and the Heckman two-step method are used to solve the endogeneity problems caused by missing variables, measurement errors, and sample self-selection errors. Third, based on the reference group theory, this paper uses the mediating effect model and the moderating effect model to empirically verify the mechanism of ITU on the PPRG. At the same time, the paper also pays attention to the differences in the perceived impact of ITU on PPRG from urban, rural, regional, and age-related perspectives.

The remainder of this paper is structured as follows. Section 2 “Theoretical analysis and research hypothesis” section introduces the mechanism based on related theories to explain the effect of ITU on the PPRG. Section 3 “Measurement strategy” section introduces the measurement model used in the empirical study of this paper. Section 4 “Data sources, variables, and descriptive statistics” section introduces the data sources, variable settings, and basic descriptive statistics used in empirical research. Section 5 “Empirical results” section shows the test results of the econometric model. Section 6 “Conclusions and Discussion” section shows the conclusions of this paper and discusses them.

2. Theoretical Analysis and Research Hypothesis

2.1. The Social Interaction Area Expansion Effect of Internet Media

Before discussing the mechanism of the impact of ITU on PPRG, we must understand the expansion effect of social interaction areas brought about by the development of Internet media. The definition of truth at least partly depends on the nature of the media, that is to say, the media has an important impact on human cognition [38]. A community composed of individuals is a major form of grouping. The cognition of the group affects the cognition of the individual. At the same time, the cognition of the individual constitutes the cognition of the group. This is a two-way interactive effect called the endogenous interaction effect [39], also defined as the neighborhood effect.

As traditional media including newspapers, radio, television, etc., expand the scope of cognition based on the original reality area of the community, endogenous interaction effect has been expanded to a certain extent. However, due to the unidirectional and non-interactive (or low level of interactivity) of traditional media information transmission, the cognitive impact on individuals is limited. Therefore, the emergence of traditional media still has certain limitations in promoting the formation of individual cognition.
Internet media is different from traditional media. It is a digital and multimedia communication medium that mainly uses computers, mobile phones, and other mobile devices as terminals to disseminate information in the form of words, sounds, images, and videos, which have the characteristics of information interaction, that is, the two-way transmission of information flow [40,41]. This feature greatly improves the limitations of traditional media in the process of forming individual cognition. Internet media has created multiple social scenes in the virtual area. One or more virtual groups are formed among different individuals. In fact, the virtual group has most of the characteristics and functions of the social area of the community, and even the efficiency of information interaction exceeds the original reality area of the community. To a certain extent, the information interaction between individuals in the virtual area is wider than that in the reality area. As social media platforms (Facebook, Twitter, WeChat, etc.) rapidly and extensively expand social circles, individuals obtain far more information from others than they might realize [42].

Based on the above analysis, the relationship among the reality area of the community, the non-interactive virtual area constructed by traditional media, and the interactive area constructed by the Internet media are shown in Figure 1. The non-interactive virtual area uses traditional media as the information source to transmit information unidirectionally to individuals in the reality area, while the Internet media realizes the link between the reality area and the interactive virtual area. The Internet media exerts a social area expansion effect and expands the range of reference groups that form perceptions for individuals.

![Figure 1. Schematic diagram of the virtual expansion effect of Internet media.](image)

2.2. The Mechanism of the Impact of ITU on PPRG

The reference group theory in social psychology recognizes that the psychological subordinate group of individuals is a group recognized by individuals to establish and maintain various standards and provide a comparative framework. Individuals use the values and norms of their reference group as a benchmark for evaluating themselves and others, and as a basis for their social outlook and values [43]. There are two main functions of the reference group: on the one hand, the reference group plays a normative role in establishing a certain behavior standard to force individuals to follow; on the other hand, the reference group plays a comparative evaluation role in evaluating oneself or others as a comparison standard and starting point [44].

As a powerful technical tool, the Internet has a positive impact on an individual’s cognition [45,46], which forms an individual’s perception or behavior further. In such a process, we must note that the processing of information is the basis for cognition [47]. The degree of dependence on Internet access to information has strengthened the degree of trust in Internet information, which has an important and positive effect on the formation
of cognition. ITU strengthens an individual's trust in Internet information by strengthening the degree of dependence on the Internet, which has an impact on an individual's cognition further. As shown in the transmission path of "ITU-ITU dependence—PPRG (individual)" in Figure 2, the ITU has an impact on PPRG by strengthening Internet dependence.

According to the reference group theory, the reference group has a comparative evaluation function. The poor–rich gap reflects the income inequality between a group. However, for the individual, PPRG mainly comes from the cognition formed by the level of income in this group and the inherent cognition of the group. When the Internet was not popularized, PPRG mainly came from within the reality community. The rapid development of the Internet represented by the mobile Internet. The income level, consumption, and wealth of external groups in the community are widely disseminated through the Internet media in the form of text, pictures, or videos. These information form highly efficient interactions in the virtual area formed by the Internet media. The ITU has an effect on the interaction process between community groups and individuals (the impact of community groups PPRG on an individual’s PPRG) by expanding or covering the PPRG of the original group, thereby affecting individual PPRG. For example, through the Internet, individuals in poor areas see the life scenes of groups in economically developed areas, and individuals in economically developed areas see the life scenes of groups in poor areas, both of which have an impact on the PPRG of individuals.

Based on the above theoretical analysis, this paper puts forward the following hypotheses to be tested:

**Hypothesis 1:** ITU has an aggravating effect on the PPRG of individuals. The more they use the Internet, the more individuals believe that the poor–rich gap becomes more serious.

**Hypothesis 2:** Internet dependence is one of the transmission mechanisms for ITU to PPRG. ITU increases the PPRG of individuals by increasing the Internet dependence of individuals.

**Hypothesis 3:** ITU exacerbates the PPRG of individuals by creating interactive virtual areas to expand individuals’ reality area (community) reference groups.

### 3. Measurement Strategy

#### 3.1. Ordered Probit Model with Instrumental Variables (IV-Oprobit Model)

According to the data distribution characteristics of the explained variables studied in this paper, PPRG is perceived as a ranking variable with a value between 0 and 10, which meets the requirements of the Oprobit model for the data distribution characteristics of the explained variables. This model adopts the maximum likelihood estimation method for
estimation. However, it is estimated that the mathematical derivation process is no longer shown, and the equation form is shown in formula (1):

\[ Y_i = F(\alpha_1 \text{Inter}_i + \alpha_2 Z_{ri} + \mu_i) \quad (1) \]

In the formula (1): \( Y_i \) represents the PPRG of the \( i \)-th resident, \( i = 1, 2, \ldots, 22,305 \); \( \text{Inter}_i \) represents ITU of the \( i \)-th resident; \( Z_{ri} \) represents the \( r \)-th control variable, \( r = 1, 2, \ldots, 13 \); \( \alpha_0, \alpha_1 \) and \( \alpha_2 \) represent the parameters to be estimated; \( \mu_i \) represents the error term. \( F(.) \) is a nonlinear function, the specific form is:

\[ F(y_i) = \begin{cases} 1 & y_i < \delta_1 \\ 2 & \delta_1 < y_i < \delta_2 \\ \vdots & \vdots \\ j & y_i > \delta_{j-1} \end{cases} \quad (2) \]

In the formula (2), \( \delta_1 < \delta_2 < \ldots < \delta_{j-1} \) are both tangent points and parameters to be estimated. \( y_i \) is an unobservable continuous variable behind \( y_{ji} \), called a latent variable, which satisfies formula (3):

\[ y_i = \alpha_1 \text{Inter}_i + \alpha_2 Z_{ri} + \mu_i \quad (3) \]

However, we were unable to collect all control variables that had an effect on PPRG, which is one of the sources of the endogeneity problem. Meanwhile, PPRG is a subjective measurement variable, and this data source characteristic may be subject to measurement error, which is the second source of endogeneity problem. To address both endogeneity problems, we refer to Wooldridge (2010) for setting the tool variables \cite{48} and use the Oprobit model with instrumental variables, as shown in Equation (4).

\[ \begin{cases} \text{Inter}_i = \omega_1 IV_i + \omega_2 Z_{ri} + \tau_i \\ y_i = \varsigma_1 \text{Inter}_i + \varsigma_2 Z_{ri} + \varsigma_3 \text{Inter}_i + \kappa_i \end{cases} \quad (4) \]

In formula (4), \( \omega_1, \omega_2, \varsigma_1, \varsigma_2, \) and \( \varsigma_3 \) represent the parameters to be estimated; \( \tau_i \) and \( \kappa_i \) represent the error term. \( IV_i \) represents the instrumental variable. \( \text{Inter}_i \) represents the fitted value of \( \text{Inter}_i \) extracted from the first line of formula (4).

### 3.2. Heckman Model

In addition to addressing the above two sources of endogeneity, we must also address a third source of endogeneity: self-selection bias. Whether residents use the Internet is not randomly distributed. Using the Oprobit model to test the impact of ITU on PPRG may bias the estimation results due to self-selection bias. To this end, this paper introduces two auxiliary variables: Internet use time (ITUT) and Internet use frequency (ITUF). On the one hand is the introduction of new variables to solve the problem of self-selection bias in ITU; on the other hand is the introduction of two new proxy variables that can characterize ITU and test the robustness of ITU impact on PPRG.

According to the Heckman model, this paper constructs a probability equation for ITU, the equation form is shown in formula (5) and the regression equation of the impact of ITUT and ITUF on PPRG, the equation form is shown in formula (6).

\[ P_i = E(Y_i > 0) = \beta_r X_{ri} + \xi_i \quad (5) \]

In formula (5), \( P_i \) represents the probability of residents using the Internet; \( X_{ri} \) represents various observable explanatory variables that affect whether residents use the Internet. \( X_{ri} \) is the same as the variable contained in \( Z_{ri} \) in formula (1). \( \xi_i \) represents the error term, and other variables have the same meaning as formula (1). The inverse Mills ratio \( \lambda_i \) can be obtained by formula (6):

\[ \lambda_i = \frac{\varphi(-X_{ri}\beta_r/\sigma)}{\Phi(-X_{ri}\beta_r/\sigma)} \quad (6) \]
In formula (6), \( \phi(.) \) is the density function of the standard normal distribution; \( \phi(.) \) is the density distribution function of the standard normal distribution, and \( \sigma \) is the standard deviation of the random error term \( \eta_i \) in the formula (5). The meaning of other variables is the same as formula (5). Furthermore, bring \( \lambda_i \) into formula (7):

\[
Y_i = \delta_0 + \delta_1 \text{Inter} - A_i + \delta_2 Z_{ri} + \delta_3 \lambda_i + \psi_i
\]  

(7)

In formula (6), \( \delta_0, \delta_1, \delta_2, \) and \( \delta_3 \) represent the parameters to be estimated, \( \text{Inter} - A_i \) represents the auxiliary variables ITUT or ITUF, \( \psi_i \) is a random error term, and the meanings of other variables are consistent with formulas (1)–(6).

Of course, in order to simultaneously address missing variables, measurement error, and sample self-selection bias, we selected instrumental variables using the same approach, i.e., the mean value of the community ITUT was selected as an instrumental variable for ITUT and the mean value of the community ITUF was selected as an instrumental variable for ITUF.

4. Data Sources, Variables, and Descriptive Statistics

4.1. Data Sources

There are two sources of data used in this paper. The first source is the China Family Panel Study (CFPS) database implemented by the Institute of Social Science Survey (ISSS) at Peking University. CFPS focuses on the economic and non-economic well-being of Chinese residents, as well as on many research topics, including economic activity, educational attainment, family relationships and family dynamics, population migration, and health. It is a national, large-scale, multidisciplinary social tracking survey project [49]. The second source is the China Statistical Yearbook (2018) from which we obtained GDP per capita data for provincial administrative regions [50]. We performed the following data processing process: first, we merged the individual-level database, household-level database, and community-level database of CFPS using Stata 16.0 software; second, we eliminated the missing values and apparently problematic data in our selected variables; third, we merged the processed CFPS database with the per capita GDP data obtained from the China Statistical Yearbook GDP data from the Chinese Statistical Yearbook. The final result is a completely new dataset containing a sample of 22,305 individual residents from 30 provincial administrative regions and 2036 communities.

4.2. Variables, Definitions, and Descriptive Statistics

Explained variable: The PPRG is the explained variable of this paper, which represents the subjective perception of the poor–rich gap in China. The average value of the sample is 7.08, reflecting Chinese residents’ belief that PPRG in China is relatively serious.

Explanatory variables: Whether the respondent uses the Internet is the core explanatory variable of this study, and its mean value reach of 0.49 is similar to the 53.7% of the year announced by the China Internet Network Information Center (CINIC) [8]. In order to solve the bias caused by selective endogeneity, this paper introduces the variables of ITUF and ITUT in the Heckman model. ITUF is an ordered variable of 1–7, the larger the value, the higher the frequency of ITU. ITUT is expressed by the time spent on the Internet per week, and the average online time of the sample is 13.66 h per week.

Control variables: This paper refers to the variable design of subjective perceptions such as happiness in the existing literature [25,51] and combines the actual needs of this article to control the variables from three aspects: individual characteristics, family characteristics, and socioeconomic environment characteristics. Individual characteristics include age, gender, education, health, etc.; family characteristics include lnincome per household, marriage, family size, etc.; socioeconomic environment characteristics include lnincome, lnpgdp, urban, etc. In order to reduce the estimation bias of the model, three regional control variables of eastern, central, and western have been set up with Northeast China as the reference area. The definitions and basic descriptive statistics of the above variables are shown in Table 1.
Table 1. Variables, definitions, and descriptive statistics.

| Variables      | N     | Definitions                                                                 | Mean (S.D.) | Min | Max |
|----------------|-------|------------------------------------------------------------------------------|-------------|-----|-----|
| PPRG           | 22,305| Perception of the poor–rich gap in China: from 0 = no serious to 10 = very serious | 7.08 (2.41) | 0   | 10  |
| ITU            | 22,305| 1 = using the Internet; 0 = not using the Internet                            | 0.49 (0.50) | 0   | 1   |
| ITUF           | 10,987| Frequency of ITU: from 1 = never to 7 = every day                            | 4.23 (1.478) | 1   | 7.4 |
| ITUT           | 10,987| Time of ITU (hour/week)                                                     | 13.66 (12.25) | 0.1 | 120 |
| ITU_depen      | 22,305| Respondents consider the importance of Internet information channels: from 1 = unimportant to 5 = very important | 2.79 (1.64) | 1   | 5   |
| age            | 22,305| Age of the respondent (years)                                               | 48.92 (15.91) | 16  | 95  |
| gender         | 22,305| 1 = male, 0 = female                                                         | 0.50 (0.50) | 0   | 1   |
| education      | 22,305| Respondent’s years of education                                              | 7.58 (5.04) | 0   | 23  |
| health         | 22,305| Self-reported health: from 1 = very healthy to 5 = very unhealthy            | 3.08 (1.22) | 1   | 5   |
| lnincome_per   | 22,305| Family net income per capita (logarithmic processing, yuan)                  | 9.62 (0.99) | 6.91 | 11.94 |
| marry          | 22,305| 1 = married; 0 = other                                                       | 0.82 (0.39) | 0   | 1   |
| familyysize    | 22,305| Family size of respondent (person)                                           | 4.16 (2.02) | 1   | 21  |
| lnincome_com   | 22,305| Community average income of respondent (logarithmic processing, yuan)       | 9.88 (0.60) | 6.91 | 11.94 |
| urban          | 22,305| 1 = respondent is located in urban, 0 = respondent is located in rural     | 0.50 (0.50) | 0   | 1   |
| lnpgdp         | 22,305| Per capita GDP of the provincial administrative region of respondent in 2017 (logarithmic processing, CNY 100 million) | 10.9 (0.46) | 10.29 | 12.07 |
| eastern        | 22,305| 1 = respondent is located in eastern China region, 0 = otherwise            | 0.32 (0.47) | 0   | 1   |
| central        | 22,305| 1 = respondent is located in central China region, 0 = otherwise            | 0.24 (0.43) | 0   | 1   |
| western        | 22,305| 1 = respondent is located in western China region, 0 = otherwise            | 0.29 (0.46) | 0   | 1   |

1 S.D. refers to standard deviation. 2 Variable ITUF is the mean value of the frequency of using the Internet to study, work, socialize, entertain, and conduct business activities. 3 Yuan is the Chinese currency: 1 USD = CNY 6.53 in 2017 (Average value of the central parity of exchange rates for the whole year). 4 Variable family size does not include family members who eat in separate kitchens. 5 According to the classification method of the National Bureau of Statistics of China, the provincial administrative regions of mainland China are divided into eastern, central, western, and northeastern regions. The eastern part includes Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan; the central part includes Shanxi, Anhui, Jiangxi, Henan, Hubei, and Hunan; the western part includes Inner Mongolia, Guanxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang; the northeast part includes Liaoning, Jilin, and Heilongjiang.

5. Empirical Results

The benchmark model and instrumental variable model test results of the impact of ITU on the PPRG are shown in Table 2. Without adding any control variables, the test results of the impact of ITU on PPRG are shown in column (1) in Table 2. The test results show that ITU has a significant positive impact on PPRG at the 1% test level, indicating that the use of the Internet by Chinese residents has aggravate their perception of the severity of the poor–rich gap in China. This test result is still robust after gradually adding the control variables, as shown in the column (3) and column (4).

Aiming at the endogenous problems caused by missing control variables and subjective measurement errors, this paper uses the instrumental variable (IV) model to further strengthen the robustness of the impact of ITU on the PPRG in the benchmark model.

In this paper, we select community Internet penetration (the mean value of ITU in the community sample, ITU_mean) as an instrumental variable. First, the selection of ITU_mean as an instrumental variable for ITU is just identification, which meets the
requirement of instrumental variable selection. Second, we need to pay attention to the issue of exogeneity of instrumental variables, as the number of instrumental variables we selected did not exceed the number of endogenous variables (without creating over-identification) and could not be tested for exogeneity at the measurement level. ITU_mean, a variable measuring the development of the Internet in the community, has difficulty in having a direct impact on the PPRG of residents, but rather influences PPRG by affecting the ITU decisions of residents in the community. Finally, ITU_mean has an effect on ITU at the 1% significance level, indicating that there is no problem of weakly instrumental variables. Therefore, our choice of ITU_mean as an instrumental variable is largely consistent with the principle of binding exclusion.

Table 2. The impact of ITU on PPRG: benchmark model and IV model test results.

| Variables       | Benchmark Model: Oprobit | IV-Oprobit         |
|-----------------|--------------------------|-------------------|
|                 | (1)                      | (2)               | (3)               | (4)               |
| ITU             | 0.337 ***                | 0.188 ***         | 0.191 ***         | 0.322 ***         |
|                 | (0.014)                  | (0.019)           | (0.019)           | (0.041)           |
| age             | −0.003 ***               | −0.003 ***        | −0.002 *          |
|                 | (0.001)                  | (0.001)           | (0.001)           |
| gender          | 0.095 ***                | 0.102 ***         | 0.100 ***         |
|                 | (0.014)                  | (0.014)           | (0.014)           |
| education       | 0.018 ***                | 0.015 ***         | 0.012 ***         |
|                 | (0.002)                  | (0.002)           | (0.002)           |
| health          | 0.045 ***                | 0.047 ***         | 0.047 ***         |
|                 | (0.006)                  | (0.006)           | (0.006)           |
| lnincome_per    | 0.013                    | 0.017 *           | 0.011             |
|                 | (0.010)                  | (0.010)           | (0.010)           |
| marry           | 0.074 ***                | 0.062 ***         | 0.059 ***         |
|                 | (0.019)                  | (0.019)           | (0.019)           |
| familysize      | −0.001                   | 0.005             | 0.005             |
|                 | (0.004)                  | (0.004)           | (0.004)           |
| lnincome_com    | 0.017                    | 0.022             | 0.015             |
|                 | (0.018)                  | (0.018)           | (0.018)           |
| lnpgdp          | 0.046 ***                | −0.116 ***        | −0.117 ***        |
|                 | (0.018)                  | (0.029)           | (0.029)           |
| urban           | 0.019                    | 0.019             | 0.014             |
|                 | (0.016)                  | (0.016)           | (0.016)           |
| eastern         | −0.019                   | −0.020            |                  |
|                 | (0.028)                  | (0.028)           |                  |
| central         | −0.110 ***               | −0.112 ***        |
|                 | (0.024)                  | (0.024)           |                  |
| western         | −0.279 ***               | −0.281 ***        |
|                 | (0.025)                  | (0.025)           |                  |
| N               | 22,305                   | 22,305            | 22,305            | 22,305            |

Standard errors in parentheses. * \( p < 0.15 \) and ** * \( p < 0.01 \). Stand In the first step of the IV-Oprobit model, ITU_mean has a significant positive effect on ITU at the 1% statistical level. Table 2 shows the results of the second step of the IV-Oprobit test only.

The instrumental variable model test result of IV-Oprobit is shown in columns (4). The IV Model test results still confirm the impact of ITU on PPRG in the benchmark model. We use the Stata16.0 software to calculate the marginal effect of the IV-Oprobit model test results in column (4) of Table 2. The marginal effect test results are shown in Table 3. When PPRG ≤ 8, ITU has a significant negative impact on PPRG, indicating that the use of the Internet weakens the residents’ PPRG (scale of 0–8) in China. For example, using the Internet would reduce the probability of residents’ perception that there is no poor–rich gap in China by 1.5% (PPRG = 0). However, when PPRG > 8, ITU has a significant positive impact on PPRG, indicating that using the Internet improves residents’ PPRG (scale of 9–10) in China. For example, using the Internet increases the probability that residents perceive the poor–rich gap in China to be very bad (PPRG = 10) by 1.0%.
Table 3. The impact of ITU on PPRG: the Marginal effect of IV-Oprobit.

| Variables | PPRG = 0 | PPRG = 1 | PPRG = 2 | PPRG = 3 | PPRG = 4 | PPRG = 5 |
|-----------|----------|----------|----------|----------|----------|----------|
| ITU       | −0.015 *** | −0.004 *** | −0.008 *** | −0.015 *** | −0.013 *** | −0.015 *** |
|           | (0.002)   | (0.001)   | (0.001)   | (0.002)   | (0.002)   | (0.002)   |
| Control   | Yes      | Yes      | Yes      | Yes      | Yes      | Yes      |
| variables |          |          |          |          |          |          |
| N         | 22,305   | 22,305   | 22,305   | 22,305   | 22,305   | 22,305   |

| Variables | PPRG = 6 | PPRG = 7 | PPRG = 8 | PPRG = 9 | PPRG = 10 |
|-----------|----------|----------|----------|----------|-----------|
| ITU       | −0.055 *** | −0.010 *** | −0.004 *** | 0.016 *** | 0.010 *** |
|           | (0.007)   | (0.001)   | (0.001)   | (0.002)   | (0.001)   |
| Control   | Yes      | Yes      | Yes      | Yes      | Yes      |
| variables |          |          |          |          |          |
| N         | 22,305   | 22,305   | 22,305   | 22,305   | 22,305   |

Standard errors in parentheses. *** p < 0.01. Table 3 reports the marginal effect in column (4) of Table 2 and only reports the marginal effect of ITU on PPRG.

Furthermore, Table 2 also reports the test results of the effect of control variables on PPRG. Age at the 1% statistical level has a significant negative impact on PPRG in the benchmark test results. It shows that with the increase in age, the PPRG of residents gradually weakened. Judging from the test results of the impact of gender on PPRG, at a statistical level of 1%, it can be considered that males are more sensitive to PPRG than females, which also passes the significance test at the 1% statistical level in the IV model. The level of education aggravates PPRG, and both the benchmark model and the IV model pass the significance test at the 1% statistical level. Education has a positive impact on an individual’s early cognitive development and adulthood cognition [52,53]. Therefore, the higher the level of education, the more sensitive the cognition of the poor–rich gap. Self-reported health has a significant positive impact on PPRG, which shows that the worse the self-reported health of residents, the higher the PPRG. This may be related to the inequality of China’s medical resources and the intuition that residents cannot get high-quality medical resources. The uneasy feeling of unhealthiness increases residents’ perception of the unfair distribution of medical resources in the process of medical treatment and aggravates their PPRG. Residents who are married are more sensitive to PPRG. The economic pressure of raising children and supporting parents in daily life exacerbates their PPRG. The IV-Oprobit model test results show that the PPRG for married residents is significantly higher than that of residents with other marital statuses at the 1% statistical level. The stronger the economy of the region where the residents live, the weaker the PPRG of the residents. The positive effect of absolute income growth due to the macroeconomy of the region masks the negative effect of residents’ perceptions of relative income disparity. This conclusion passed the test at the statistical level of 1% in both the benchmark model and the IV model that control regional variables.

Through the establishment of the IV model, some of the errors caused by the endogeneity of missing variables and subjective measurement errors have been solved. However, the bias caused by self-selection bias in ITU has not been considered. To this end, we established the Heckman two-step method by introducing the two auxiliary variables of ITUT and ITUF to solve the self-selection bias of ITU samples and further test the robustness of ITU’s impact on the PPRG.

Columns (1) and (2) of Table 4, respectively, report the results of the second step of the Heckman two-step method using ITUT and ITUF. The test results show that both ITUT and ITUF pass the significance test at the statistical level of 1%. The Mills lambda test values all passed the test at a significance level of 1%, indicating that there is indeed a problem of self-selection bias in ITU under the full sample condition, and it is necessary to adopt the Heckman model.

We also draw on the same method of selecting instrumental variable ITU_mean for ITU. The IV-Heckman model was established by introducing community ITUT (ITUT_mean of the sample within the community) and community ITUF (ITUF_mean of the
sample within the community, ITUF_mean) as the instrumental variables of ITUT and ITUF, respectively, considering the endogeneity problems caused by measurement deviation, missing variables, and self-selection bias. Columns (3) and (4) of Table 4 report the test results of the IV-Heckman model. The test results still support test results of Heckman Model. ITU has a significant positive impact on the PPRG, that is, ITU exacerbates the PPRG of residents.

Table 4. The impact of ITU on PPRG considering the endogeneity of sample self-selection: Heckman model and IV-Heckman test results.

| Variables | Heckman Model | IV-Heckman Model |
|-----------|---------------|------------------|
|           | (1)           | (2)              | (3)           | (4)           |
| ITUT      | 0.008 ***     |                  | 0.011 ***     |               |
|           | (0.002)       |                  | (0.002)       |               |
| ITUF      | 0.095 ***     | 0.180 ***        |               |               |
|           | (0.017)       | (0.038)          |               |               |
| Control variables | Yes | Yes | Yes | Yes |
| Mills lambda | −0.502 *** | −0.535 *** | −0.243 *** | −0.269 *** |
|           | (0.146)       | (0.146)          | (0.072)       | (0.071)       |
| N         | 10,987        | 10,987           | 10,987        | 10,987        |

Standard errors in parentheses. *** p < 0.01. Only show the results of the second step of the Heckman two-step method. The selected instrumental variables do not have weak instrumental variables problem. ITUT_mean has a significant positive effect on ITUT at the 1% statistical level. ITUF_mean has a significant positive effect on ITUF at the 1% statistical level.

This paper also conducts a further analysis from the heterogeneity perspective of urban-rural differences, regional differences, and age differences.

Urban and rural heterogeneity: Columns (1) and (2) in Table 5, respectively, report the impact of ITU in urban and rural areas on PPRG using IV-Oprobit model. The test results show that, whether in urban or rural areas, ITU has significantly increased the PPRG of residents. Columns (3) and (4) report the marginal effects of the IV-Oprobit model. The test results show that there are significant differences between urban and rural areas. Using the Internet increases urban residents’ PPRG by 11.3%. While for rural residents, it only increased PPRG by 7.4% (based on calculated results of the marginal effect when PPRG = 10). With the continuous advancement of China’s urban–rural integration process, Internet barriers in rural areas have gradually disappeared, and Internet accessibility has greatly improved. However, the application scenarios of the Internet still lag in rural areas. More abundant Internet application scenarios may be the entry point to explain the differences between urban and rural areas.

Table 5. Urban and rural heterogeneity: test results of the impact of ITU on the PPRG.

| Variables | IV-Oprobit Model | Marginal Effect (PPRG = 10) |
|-----------|-----------------|-----------------------------|
|           | Urban | Rural | Urban | Rural | Urban | Rural |
| ITU       | 0.208 *** | 0.171 *** | 0.113 *** | 0.074 *** |
|           | (0.027) | (0.027) | (0.016) | (0.020) |
| Control variables | Yes | Yes | Yes | Yes |
| N         | 11,220 | 11,085 | 11,220 | 11,085 |

Standard errors in parentheses. *** p < 0.01.

Regional heterogeneity: Columns (1)–(4) in Table 6, respectively, report the impact of ITU on the PPRG in the eastern, central, western, and northeastern regions of China using the IV-Oprobit model. The test results show that, regardless of the region, ITU has significantly increased the PPRG of residents. However, from the test results of the marginal effects of the IV-Oprobit model in columns (5)–(8), it is found that there are differences in the degree of impact of ITU on PPRG in different regions, which is specifically reflected in:
the impact of ITU on the PPRG deepened successively in the northeastern, western, eastern, and central regions (based on calculated results of the marginal effect when PPRG = 10). The economic development of the northeast and western regions is relatively backward compared with other regions in China. The Internet penetration rate in the northeastern and western regions is lower than that in the eastern and central regions, and the Internet application scenarios are still incomplete, especially in rural areas (this can be reflected in the test results of urban–rural heterogeneity). ITU reconstructs the social values and normative perceptions of the residents relying heavily on rich Internet application scenarios. Therefore, ITU has a higher exacerbating effect on the PPRG of residents in developed regions than in less developed regions.

Table 6. Regional heterogeneity: test results of the impact of ITU on the PPRG.

| Variables | IV-Oprobit Model | Marginal Effect (PPRG = 10) |
|-----------|------------------|-----------------------------|
|           | Eastern | Central | Western | Northeast | Eastern | Central | Western | Northeast |
| ITU       | 0.224 *** | 0.178 *** | 0.163 *** | 0.219 *** | 0.095 *** | 0.126 *** | 0.078 *** | 0.073 * |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N         | 7155 | 5460 | 6552 | 3138 | 7155 | 5460 | 6552 | 3138 |

Standard errors in parentheses. *p < 0.1 and ***p < 0.01.

Table 7. Age heterogeneity: test results of the impact of ITU on PPRG.

| Variables | IV-Oprobit Model | Marginal Effect (PPRG = 10) |
|-----------|------------------|-----------------------------|
|           | [16, 30] | [30, 50] | [50, 70] | [70, 95] | [16, 30] | [30, 50] | [50, 70] | [70, 95] |
| ITU       | 0.196 | 0.286 *** | 0.382 *** | 0.693 *** | 0.057 | 0.091 *** | 0.118 *** | 0.180 *** |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N         | 3589 | 8008 | 8796 | 1912 | 3589 | 8008 | 8796 | 1912 |

Standard errors in parentheses. ***p < 0.01. The minimum age of the resident sample is 16 years old and the highest is 95 years old. The age group includes the lower limit, but both the 95-year-old and 70-year-old samples were included in the 70–95 age range.
Through the above analysis, ITU has a significant aggravating effect on PPRG, and Hypothesis 1 has been verified. Furthermore, we analyze the mechanism of ITU’s impact on PPRG and further verify Hypothesis 2 and Hypothesis 3 proposed in the theoretical analysis.

Constructing an intermediary effect model to analyze the transmission mechanism between ITU and PPRG: According to the theoretical analysis, the degree of residents’ dependence on Internet information channels may be a transmission mechanism of the impact of ITU on the PPRG. Columns (1)–(3) in Table 8 use the Oprobit model to test whether ITU_depen is a transmission mechanism of the ITU on the perception of the wealth gap, that is, whether ITU_depen is an intermediary variable. The test results show that ITU has a significant positive impact on PPRG. This result is consistent with all previous model test results. At the same time, ITU has a significant positive effect on ITU_depen at a statistical level of 1%, and ITU_depen also plays a positive impact on PPRG. Therefore, it can be considered that ITU further aggravates the PPRG of residents by increasing the residents’ reliance on Internet information. Furthermore, it is shown by calculation that the intermediary effect played by ITU_depen in the process of perceived impact of ITU on PPRG accounts for 32.12% of the total effect, which further proves that ITU_depen is an important transmission mechanism (based on calculated results of the marginal effect when PPRG = 10). Therefore, Hypothesis 2 is verified.

Table 8. Test results of the mediating effect of ITU_depen.

| Variables         | Oprobit Model |             |             |
|-------------------|---------------|-------------|-------------|
|                   | (1)           | (2)         | (3)         |
|                   | PPRG | Inter_Depen | PPRG        |
| ITU               | 0.191 ***     | 1.203 ***   | 0.115 ***   |
|                   | (0.019)       | (0.021)     | (0.021)     |
| ITU_depen         |               | 0.051 ***   |             |
|                   |               | (0.006)     |             |
| Control variables | Yes           | Yes         | Yes         |
| N                 | 22,305        | 22,305      | 22,305      |

Standard errors in parentheses. *** p < 0.01.

In the theoretical analysis, based on the reference group theory, this paper proposes the Internet as a new medium to expand the reality area of residents with virtual areas. The virtual area expands the reference group and is no longer limited to the community where the residents live. Therefore, this paper uses the average value of PPRG in the community other than the residents themselves to represent the reality area and set it as an explanatory variable (Mean_PPRG), which uses ITU as the moderating variable and PPRG as the explained variable to establish a moderating effect model to test whether the Internet has expanded the reference group of residents and aggravated the transmission mechanism of PPRG. Columns (1) and (2) in Table 9 report the test results using the Oprobit model and the IV-Oprobit model. The test results of the two models both show that at a statistical level of 1%, Mean_PPRG has a significant positive impact on PPRG, and ITU also has a significant positive impact on PPRG. At the same time, the interaction term (Mean_PPRG * ITU) exerts a significant negative impact on PPRG. Therefore, while ITU exacerbates PPRG, it plays a negative role in mediating the impact of Mean_PPRG on PPRG.

Furthermore, we discuss whether the use of the Internet has expanded the reference group of residents with virtual areas through the test results of columns (3) and (4) in Table 9. Taking the test result of marginal effect of Oprobit model in column (3) as an example, ITU has an aggravating effect on PPRG to 0.072, which is much higher than the negative effect of Mean_PPRG * ITU’s impact on PPRG to 0.026. It can be considered that although the virtual area brought by the Internet has partially replaced the reality area, the virtual area brought by the Internet together with the original reality area has realized the expansion of the reference group of residents. In this way, the net effect of ITU on PPRG is 0.046. In the Marginal effect of IV-Oprobit model shown in column (4), the net effect of ITU
through expanding the reference group after the endogeneity is resolved is 0.037, and the robustness of this conclusion is verified (based on calculated results of the marginal effect when PPRG = 10). Therefore, Hypothesis 3 is verified.

### Table 9. Test results of the mediating effect of ITU on PPRG.

| Variables | Orpobit Model | IV-Orpobit Model | Marginal Effect (PPRG = 10) |
|-----------|---------------|-----------------|-----------------------------|
|           | (1)           | (2)             | (3)                         | (4)                          |
| Mean_PPRG | 0.182 ***     | 0.250 ***       | 0.055 ***                   | 0.076 ***                    |
|           | (0.019)       | (0.044)         | (0.006)                     | (0.013)                      |
| ITU       | 0.236 ***     | 0.264 ***       | 0.072 ***                   | 0.080 ***                    |
|           | (0.013)       | (0.019)         | (0.004)                     | (0.006)                      |
| Mean_PPRG * ITU | −0.085 *** | −0.143 ***      | −0.026 ***                  | −0.043 ***                   |
|           | (0.018)       | (0.031)         | (0.005)                     | (0.009)                      |
| Control variables | Yes | Yes | Yes | Yes |
| N         | 21,458        | 21,458          | 21,458                      | 21,458                       |

Standard errors in parentheses. *** p < 0.01.

### 6. Conclusions and Discussion

#### 6.1. Conclusions

The development of the Internet has brought many positive effects, including promoting economic growth, increasing residents’ chances of earning income, and contributing to poverty alleviation. These large amounts of literature have been discussed and studied. However, the negative impact that the Internet may have on individual perceptions of residents is rarely involved. This paper empirically studies the impact of ITU on the PPRG of residents and its mechanism by constructing an econometric model. Based on the full text analysis, the following brief conclusions can be drawn:

Firstly, we found that ITU has increased the PPRG of residents. In China, residents who use the Internet believe that PPRG in China is worse than those who do not. After constructing the IV model, Heckman model, and IV-Heckman model to solve the endogenous problems caused by missing variables—measurement bias and sample self-selection—the above test results are still robust.

Secondly, there are obvious differences in the impact of ITU on PPRG in the perspective of urban and rural heterogeneity, regional heterogeneity, and age heterogeneity. Overall, the significance test is passed regardless of the sub-sample. The aggravating effect of urban residents’ ITU on PPRG is higher than that of rural residents. The aggravating effect of ITU by residents in economically developed areas on PPRG is significantly higher than that of residents in underdeveloped areas. The aggravating impact of ITU by residents at different age (except the 16–30-year-old group) on PPRG shows a clear linear increase law. Internet use by the 16–30-year-old group did not have a significant impact on PPRG.

Third, we further studied the mechanism of the impact of ITU on PPRG. The study found that the degree of dependence on Internet information is one of the transmission mechanisms of the impact of ITU on PPRG. The test results of the mediating effect model show a significance level of 1%; the mediating effect played by the degree of dependence on Internet information accounts for 32.12% of the total effect.

Fourth, the Internet plays the role of a new interactive medium, expanding the reference group of residents through virtual areas and exacerbating residents’ PPRG. By constructing a moderating effect model, the moderating effect of ITU in the process of the impact of PPRG_mean on PPRG among residents was tested. In the test results of the mediation effect model with instrumental variables, the use of the Internet exerted the effect of increasing PPRG at 0.080, while weakening the impact of PPRG_mean on PPRG. However, there is a net increase effect of residents’ ITU by expanding the residents’ reference group’s PPRG to 0.037.
6.2. Discussion

The Internet, as a technology embedded in economic and social development, has a positive impact on the promotion of social equality proposed by SDGs. The positive impact of Internet development on objective welfare, including the objective poverty gap and income level, has been fully discussed. At the same time, it has also been discussed that the digital divide may generate new social exclusion [54]. However, we must realize that the positive effect of subjective well-being in the creation of objective well-being cannot be ignored. A positive attitude and a high level of subjective well-being has positive effects on the creation of objective well-being. Therefore, our research explores the impact of Internet development on subjective well-being from the perspective of reference group changes, that is, to explore two main topics: what impact does ITU have on PPRG and how does ITU affect PPRG? It provides an explanation path of ITU’s impact on PPRG from the perspective of sociological theory.

Therefore, our research provides a new entry point and idea for the study of the impact of the Internet on subjective well-being. The double-edged sword of Internet development is not only reflected in the creation process of objective welfare (improving the overall income level but expanding income gap), and it is also reflected in the creation of subjective well-being (improving the overall sense of well-being but increasing PPRG). We must realize that the impact of the Internet on economic and social development is comprehensive, complex, and multi-layered, which requires further joint discussions among multiple disciplines such as economics, management, and sociology.

Based on the reference group theory, this paper analyzes PPRG by the Internet and its mechanism of action by constructing an Oprobit model. In the process of empirical analysis, the instrumental variable model, Heckman model, and IV-Heckman model are used for robustness testing, aiming to solve the endogeneity problems caused by missing variables, measurement errors, and sample self-selection. It also analyzes the impact of ITU on the PPRG of residents under the perspective of urban and rural, regional, and age heterogeneity. Furthermore, ITU_depen is used as a mediating variable to establish a mediating effect test model and ITU as a moderating variable to establish a moderating effect model to discuss the mechanism of ITU on PPRG. All empirical results verify the aggravating effect of ITU on the PPRG of residents. Our research findings further illustrate that Internet development is not only a “double-edged sword” at the objective level, but also has negative impacts at the subjective level.

China is in a process of dramatic social change and any technological development will have certain negative effects. Against the backdrop of Internet penetration and the development of the new “Internet+” business model, this paper takes China, a large developing country with a large population, as the research object, and concludes through an empirical model that ITU has an exacerbating effect on PPRG among residents, which has certain policy implications for Internet development worldwide. On the one hand, subjective perception is necessarily generated from the existence of an objective wealth gap. The financial departments of each country need to further optimize fiscal and taxation policies, improve the income distribution system, and gradually reduce the objective wealth gap, and various world organizations (such as the United Nations, World Bank, etc.) should work to gradually eliminate the income gap between countries and make efforts to achieve the elimination of inequality between countries in accordance with SDGs. On the other hand, the development of the Internet has promoted the communication efficiency and visualization of information, and the capital-driven “traffic economy” has led to the flooding of the Internet with some spam and false information. This requires advanced artificial intelligence technology to filter and shield undesirable information such as spam and malicious information on the Internet, so as to alleviate the negative impact of the Internet at the subjective level and further improve residents’ sense of well-being.

However, this paper still has certain limitations. On the one hand, although we have discussed the two potential impact mechanisms of ITU on PPRG, there are still other potential mechanisms that have not been taken into consideration. On the other hand, due
to the limitations of the database, metrology technology, and the stage of development of the Internet in China, this paper is mainly based on CFPS2018 cross-section data, and it is impossible to consider the continuous impact of ITU on the PPRG of individuals in the time series. Although only cross-sectional data is used, the test results of different measurement models in this paper can be mutually verified and can support the conclusions of this paper. The relevant findings of this research provide new inspiration for the impact of the Internet on the subjective perception of individuals, especially the potential negative effects that may be brought about using the Internet. Extending the data to panel data and discussing more impact mechanisms of ITU on PPRG is the focus of the next step of research.

Author Contributions: X.Z. contributed to conceptualization; data curation; formal analysis; software; writing—original draft; and writing—review and editing. Z.H. contributed to funding acquisition; supervision; validation; and writing—review and editing. All authors have read and agreed to the published version of the manuscript.

Funding: The authors would like to thank the funding support from the President’s Youth Fund of the Institute of Science and Development, Chinese Academy of Sciences.

Data Availability Statement: The CFPS data set used in this manuscript can be downloaded from the following website, http://www.isss.pku.edu.cn/cfps/, accessed on 11 January 2022.

Conflicts of Interest: The authors declare no conflict of interest.

References
1. Details about SDGs Can Be Found at the Following Website. Available online: https://www.un.org/sustainabledevelopment/ (accessed on 11 January 2022).

2. Alesina, A.; Di Tella, R.; MacCulloch, R. Inequality and happiness: Are Europeans and Americans different? J. Public Econ. 2004, 88, 2009–2042. [CrossRef]

3. Kang, W.C.; Lee, J.S.; Song, B. Envy and Pride: How Economic Inequality Deepens Happiness Inequality in South Korea. Soc. Indic. Res. 2020, 150, 617–637. [CrossRef]

4. Kollampambmil, U. Happiness, happiness inequality and income dynamics in South Africa. J. Happiness Stud. 2020, 21, 201–222. [CrossRef]

5. Zhu, Z.; Ma, W.; Sousa-Poza, A.; Leng, C. The effect of internet usage on perceptions of social fairness: Evidence from rural China. China Econ. Rev. 2020, 62, 101508. [CrossRef]

6. Zhang, J.; Cheng, M.; Yu, N. Internet Use and Lower Life Satisfaction: The Mediating Effect of Environmental Quality Perception. Ecol. Econ. 2020, 176, 106725. [CrossRef]

7. Wu, S.; Wang, P.; Sun, B. Can the Internet narrow regional economic disparities? Reg. Stud. 2021, 56, 324–337. [CrossRef]

8. Data Source: China Internet Network Information Center. Available online: http://www.cnnic.com.cn/IDR/ReportDownloads/ (accessed on 11 January 2022).

9. Paunov, C.; Rollo, V. Has the internet fostered inclusive innovation in the developing world? World Dev. 2016, 78, 587–609. [CrossRef]

10. Relich, M. The impact of ICT on labor productivity in the EU. Inf. Technol. Dev. 2017, 23, 706–722. [CrossRef]

11. Qiang, C.; Carlo, M. Information and Communications for Development 2009: Extending Reach and Increasing Impact. 2009. Available online: https://www.comminit.com/content/information-and-communications-development-2009-extending-reach-and-increasing-impact (accessed on 20 July 2009).

12. Niebel, T. ICT and economic growth–Comparing developing, emerging and developed countries. World Dev. 2018, 104, 197–211. [CrossRef]

13. Bauer, J.M. The Internet and income inequality: Socio-economic challenges in a hyperconnected society. Telecommun. Policy 2018, 42, 333–343. [CrossRef]

14. Ho, C.-C.; Tseng, S.-F. From digital divide to digital inequality: The global perspective. Int. J. Internet Entrep. Manag. 2006, 4, 215–227. [CrossRef]

15. Scheerder, A.; Van Deursen, A.; Van Dijk, J. Determinants of Internet skills, uses and outcomes. A systematic review of the second-and third-level digital divide. Telemat. Inform. 2017, 34, 1607–1624. [CrossRef]

16. Yang, L.; Lu, H.; Wang, S.; Li, M. Mobile Internet Use and Multidimensional Poverty: Evidence from A Household Survey in Rural China. Soc. Indic. Res. 2021, 158, 1065–1086. [CrossRef]

17. Zhao, J. Internet usage and rural self-employment in China. Asian Perspect. 2020, 44, 77–101. [CrossRef]

18. Yang, Y.; Fu, C. Inclusive financial development and multidimensional poverty reduction: An empirical assessment from rural China. Sustainability 2019, 11, 1900. [CrossRef]
19. Huang, C.-C.; Jin, H.; Zhang, J.; Zheng, Q.; Chen, Y.; Cheung, S.; Liu, C. The effects of an innovative e-commerce poverty alleviation platform on Chinese rural laborer skills development and family well-being. *Child. Youth Serv. Rev.* 2020, 116, 105189. [CrossRef]
20. YILMAZ, R.; KOYUNCU, J.Y. The Contribution of ICT to Poverty Reduction: A Panel Data Evidence. *Sos. Bilimler Araştırmaları Derg.* 2018, 7, 63–75.
21. Mora-Rivera, J.; García-Mora, E. Internet access and poverty reduction: Evidence from rural and urban Mexico. *Telecommun. Policy* 2021, 45, 102076. [CrossRef]
22. Bahia, K.; Castells, P.; Cruz, G.; Masaki, T.; Rodríguez-Castelán, C.; Sanfelice, V. Mobile Broadband Internet, Poverty and Labor Outcomes in Tanzania. IZA Discussion Paper No. 14720. Available online: https://ssrn.com/abstract=3921510 (accessed on 11 September 2021).
23. Appiah-Otoo, I.; Song, N. Two kinds of information processing in cognition. *Rev. Philos. Psychol.* 2020, 11, 591–611. [CrossRef]
24. Xu, Y.; Huang, Y. Chinese Middle-Aged and Older Adults’ Internet Use and Happiness: The Mediating Roles of Loneliness and Social Engagement. *J. Appl. Gerontol.* 2020, 40, 1846–1855. [CrossRef]
25. Zhu, Z.; Ma, W.; Leng, C.; Nie, P. The relationship between happiness and consumption expenditure: Evidence from rural China. *Appl. Res. Qual. Life* 2021, 16, 1587–1611. [CrossRef]
26. Oh, H.J.; Ozkaya, E.; LaRose, R. How does online social networking enhance life satisfaction? The relationships among online supportive interaction, affect, perceived social support, sense of community, and life satisfaction. *Comput. Hum. Behav.* 2014, 30, 69–78. [CrossRef]
27. Castellacci, F.; Tveito, V. Internet use and well-being: A survey and a theoretical framework. *Res. Policy* 2018, 47, 308–325. [CrossRef]
28. Kohnert, D. The impact of digitalization on poverty alleviation in Africa. *SSRN* 2021, 3944941. [CrossRef]
29. Kraut, R.; Patterson, M.; Lundmark, V.; Kiesler, S.; Mukhopadhyay, T.; Scherlis, W. Internet paradox: A social technology that reduces social involvement and psychological well-being? *Am. Psychol.* 1998, 53, 1017. [CrossRef]
30. Wadhwa, V.; Palvia, S. Is information technology hacking our happiness? *J. Inf. Technol. Case Appl. Res.* 2018, 20, 151–157. [CrossRef]
31. Huang, C. Internet use and psychological well-being: A meta-analysis. *Cyberpsychol. Behav. Soc. Netw.* 2010, 13, 241–249. [CrossRef]
32. Gross, E.F.; Juvonen, J.; Gable, S.L. Internet use and well-being in adolescence. *J. Soc. Issues* 2002, 58, 75–90. [CrossRef]
33. Cardak, M. Psychological well-being and Internet addiction among university students. *Turk. Online J. Educ. Technol.-TOJET* 2013, 12, 134–141.
34. Wang, L.; Luo, J.; Bai, Y.; Kong, J.; Luo, J.; Gao, W.; Sun, X. Internet addiction of adolescents in China: Prevalence, predictors, and association with well-being. *Addict. Res. Theory* 2013, 21, 62–69. [CrossRef]
35. Zhang, S.; Li, F.; Xiao, J.J. Internet penetration and consumption inequality in China. *Int. J. Consum. Stud.* 2020, 44, 407–422. [CrossRef]
36. Qiu, L.-J.; Zhong, S.-B.; Sun, B.-W.; Song, Y.; Chen, X.-H. Is internet penetration narrowing the rural–urban income inequality? A cross-regional study of China. *Qual. Quant.* 2021, 55, 1795–1814. [CrossRef]
37. Shi, A.; Zhou, X.; Xie, Z.; Mou, H.; Ouyang, Q.; Wang, D. Internet Plus Health Care’s Role in Reducing the Inequality of High-Quality Medical Resources in China. *Asia Pac. J. Public Health* 2021, 33, 997–998. [CrossRef] [PubMed]
38. Postman, N. *Amusing Ourselves to Death: Public Discourse in the Age of Show Business*; Penguin Publishing Group: London, UK, 2006.
39. Manski, C.F. Economic analysis of social interactions. *J. Econ. Perspect.* 2000, 14, 115–136. [CrossRef]
40. Tedesco, J.C. Examining Internet interactivity effects on young adult political information efficacy. *Am. Behav. Sci.* 2007, 50, 1183–1194. [CrossRef]
41. Bucy, E.P. Second generation net news: Intactivity and information accessibility in the online environment. *Int. J. Media Manag.* 2004, 6, 102–113. [CrossRef]
42. Marsh, E.J.; Rajaram, S. The digital expansion of the mind: Implications of internet usage for memory and cognition. *J. Appl. Res. Mem. Cogn.* 2019, 8, 1–14. [CrossRef]
43. Stafford, J.E.; Cocanougher, B.A. Reference group theory. *Sel. Asp. Consum. Behav.* 1977, 361–380.
44. Kelley, H.H. Two functions of reference groups. In *Readings in Social Psychology*, 2nd ed.; Swanson, G.E., Newcomb, T.M., Hartley, E.L., Eds.; Holt, Rinehart & Winston: New York, NY, USA, 1952; pp. 410–414.
45. Yu, D.; Fiebig, D.G. Internet use and cognition among middle-aged and older adults in China: A cross-lagged panel analysis. *J. Econ. Ageing* 2020, 17, 100262. [CrossRef]
46. Voinea, C.; Vică, C.; Mihailov, E.; Savulescu, J. The internet as cognitive enhancement. *Sci. Eng. Ethics* 2020, 26, 2345–2362. [CrossRef]
47. Sprevak, M. Two kinds of information processing in cognition. *Res. Philos. Psychol.* 2020, 11, 591–611. [CrossRef]
48. Wooldridge, J.M. *Econometric Analysis of Cross Section and Panel Data*; MIT Press: Cambridge, MA, USA, 2010.
49. From the Introduction of the CFPS on ISSS. Available online: http://www.issss.pku.edu.cn/cfps/ (accessed on 11 January 2022).
50. China Statistical Yearbook 2018. Available online: http://www.stats.gov.cn/tjsj/ndsj/2018/indexch.htm (accessed on 11 January 2022).

51. Wang, P.; Pan, J.; Luo, Z. The impact of income inequality on individual happiness: Evidence from China. Soc. Indic. Res. 2015, 121, 413–435. [CrossRef]

52. Shanmugan, S.; Satterthwaite, T.D. Neural Markers of the Development of Executive Function: Relevance for Education. Curr. Opin. Behav. Sci. 2016, 10, 7–13. [CrossRef] [PubMed]

53. Kwon, O.D.; Cho, S.S.; Seo, S.W.; Na, D.L. Effect of illiteracy on neuropsychological tests and glucose metabolism of brain in later life. J. Neuroimaging 2012, 22, 292–298. [CrossRef]

54. Tewathia, N.; Kamath, A.; Ilavarasan, P.V. Social inequalities, fundamental inequities, and recurring of the digital divide: Insights from India. Technol. Soc. 2020, 61, 101251. [CrossRef]