sustainability

MDPI

Article

Does Internet Use Boost the Sustainable Subjective Well-Being of Rural Residents? Evidence from Rural China

Houxi Zhou [1,†], Xuebiao Zhang [1,†], Candi Ge [2], Jingyi Wang [1,*] and Xiaolong Sun [2,*]

[1] Agricultural Information Institute, Chinese Academy of Agricultural Sciences, Beijing 100081, China
[2] Institute of Agricultural Economics and Development, Jiangsu Academy of Agricultural Sciences, Nanjing 210014, China
* Correspondence: wangjingyi01@caas.cn (J.W.); xlsun890105@jaas.ac.cn (X.S.)
† These authors contributed equally to this work.

Abstract: The rapid development of the internet is affecting rural residents' well-being profoundly in China. To empirically investigate the impacts of internet use on farmers' subjective well-being, the latest version of the China Family Panel Studies data is utilized and multiple regression methods are employed. The results of the ordered logit model indicate that internet use positively affects farmers' subjective well-being. Propensity score matching and endogenous switching regression are used to eliminate possible endogeneity and still reveal robust results. The frequencies of online study, online social interaction, and online entertainment are important channels influencing farmers' subjective well-being. Furthermore, the impacts of internet use are heterogeneous. Internet users from the central and western regions have higher levels of subjective well-being than their counterparts from the eastern region. Young and middle-aged internet users are happier than the elderly ones. Therefore, the government ought to fully cover rural areas with the internet, eliminate the digital division, especially in Central and Western China, and pay more attention to internet use by the elderly.

Keywords: internet use; subjective well-being; rural residents; China

Citation: Zhou, H.; Zhang, X.; Ge, C.; Wang, J.; Sun, X. Does Internet Use Boost the Sustainable Subjective Well-Being of Rural Residents? Evidence from Rural China. *Sustainability* **2023**, *15*, 1652. https://doi.org/10.3390/su15021652

Received: 23 November 2022
Revised: 31 December 2022
Accepted: 9 January 2023
Published: 14 January 2023

1. Introduction

Achieving sustainable development and enhancing residents' subjective well-being are ideal patterns and ultimate goals globally in the process of sustainable development. With the rapid promotion of informatization, the popularization of ICT (information and communications technology) in China has achieved a leap forward in progress. However, urbanization in China has led to a mass exodus of labor. The structure of the rural left-behind population has been described as "386199" (It refers to the special vulnerable group of women, children and elderly people left behind in rural areas. "38" refers to the "8th March" Women's Day, which represents women; "61" refers to the "1st June" Children's Day, which represents children; "99" refers to the elder people). The continuous household income growth has not had the corresponding positive impact on the subjective well-being of this vulnerable group [1,2]. However, new infrastructure investments and internet usage are proved to be effective in increasing the resilience of economic growth and achieving sustainable development, which in turn enhances people's well-being [3,4].

This social issue and moral dilemma are also widespread in other countries. The development of rural areas has been a priority for the Chinese government in recent years. The 2021 No.1 Central Document points out that China will put forward a Digital Villages Strategy. According to the China Digital Village Development Report initiated by the Cyberspace Administration of China (CAC) and the Ministry of Agriculture and Rural Affairs (MARA), more than 98% of China's administrative villages have access to optical fiber and 4G by November 2020. Approximately 139 million rural residents have access to broadband in 2020, with an 8% increase over last year. The 47th China Statistical Report on Internet Development issued by China Internet Network Information Center (CNNIC)

shows that the number of rural internet users reached 309 million by the end of 2020, with a 54 million increase over March 2020, accounting for 31.2% of total internet users in China. Meanwhile, the popularization of the internet in rural areas is 55.9%, a 9.7% increase over March 2020.

Internet use has exerted a revolutionary impact on China's economy and people's well-being. Referring to the World Happiness Report of 2020, China ranks 94th among 156 surveyed countries in terms of people's subjective well-being. With more than 500 million rural residents in China, the nation should attach importance to farmers' subjective well-being, as it significantly affects the harmony and stability of China. With the implementation of Rural Revitalization Strategy since 2018, China has made an active exploration in combining ICT with agricultural development, for example, the construction of the Taobao Villages. The promotion of rural e-commerce stimulates farmers' income through opening up new sales and consumption channels of agricultural products and providing a range of services such as online agent purchase and payment [5]. Internet use also links rural residents to urban counterparts as the process of urbanization is accelerating in China, thus improving social connectedness that contributes to subjective well-being. Moreover, faced with systemic risks such as COVID-19, the internet is proven to substitute physical connection [6] and has a considerable extent to dispel the fear of the unknown and uncertainty at the psychological level [7].

The study of subjective well-being originated from psychology and sociology. Easterlin [8] introduced happiness into economic study. Scholars have investigated influencing factors of subjective well-being, among which income plays the most important role. Easterlin [8] points out that as the income level is the ultimate goal pursued by people, income and subjective well-being are basically the same thing. This opinion has been supported by Stevenson and Wolfers [9] and Brzezinski [10]. Brzezinski [10] finds a positive correlation between personal income and subjective well-being, and reveals that residents from the top-1%-income-level countries tend to be happier than those from low-income countries. Internet use affects subjective well-being through improving family income. As indicated by Hitt and Tambe [11] and Mishra and Williams [12], internet use improves the resource allocation of farmer households and facilitates business management, thus promoting family well-being. Other influencing factors such as age, gender, income, education, marriage status, and employment also draw scholars' attention when studying people's subjective well-being [13–16]. Moreover, existing studies find that environmental factors, including air pollution and climate change, affect people's subjective well-being to some extent [17,18]. Thus, scholars conclude that extreme weather and air pollution reduce the level of subjective well-being.

The internet is utilized in many fields and has changed people's modes of living, studying and working. The impact of internet use on people's well-being has been the focus of various academic studies. The internet enables people to get connected more easily and communicates more efficiently through brand-new ways to develop and maintain networks [19]. For example, Bruni and Stanca [20] and Benedetto and GuiLuca [21] find that internet use increases the consumption of relational goods, which requires time to share with families and friends, so the time dedicated to relational activities may be increased. People are connected with their families and friends through internet (e.g., by emailing, phone calls and video chats), instead of in-person interactions. Online interactions complement social networking, making people feel more connected with each other [22]. David et al. [23] find that internet users are less likely to have clinically relevant depression than non-users, based on data from the Health and Retirement Study. Internet users also report higher levels of personal growth in life and better self-reported health than non-users [24]. However, different purposes of internet use could lead to various results. Erickson and Johnson [25] find that using the internet for communication and information seeking increases life satisfaction and decreases depression. Tamara and Reed [26] conclude that when using the internet to fulfill informational goals, people report better physical and subjective health but lower life satisfaction.

Existing studies have investigated the impact of internet use on economic well-being [27], income growth [28], psychological health [29], and subject well-being [5] of rural residents in China. However, few researchers examine the effects of internet use on farmers' subjective well-being in China and elsewhere. This study fills the knowledge gap through exploring how internet use affects farmers' subjective well-being, based on micro-level household data. The paper contributes to the existing literature from three aspects. First, the paper analyzes the influencing mechanism of internet use on the subjective well-being of rural residents. Accounting for a large proportion of the total population, farmers' life quality guarantees social stability and harmony in China. However, Chinese farmers are mostly smallholders who have poor access to financial services and information-searching methods. Therefore, it is meaningful to investigate the benefits of internet development for farmers and its inner mechanism, thus providing suggestions for policymakers. Second, this study employs multiple regression methods to deal with the endogeneity for more reliable empirical results, such as the ordered logit (Ologit), propensity score matching (PSM), and endogenous treatment regression (ESR). Third, the study is conducted based on the 2018 China Family Panel Studies (CFPS), which are the latest version of household-level data and reflect the most up-to-date situation of farmers' well-being.

The remainder of this study is structured as follows. Section 2 presents the conceptual framework. Section 3 outlines the model, methodology, and data. Section 4 reports and describes the empirical results. Section 5 further discusses the results. Section 6 concludes this study and provides policy implications.

2. Conceptual Framework

Affiliation with others is a basic human need [30] and is the premise of subjective well-being establishment as well. In a traditional Chinese family, rural residents maintain close intergenerational connections. However, nowadays, the elders in rural areas tend to live alone or with a spouse [31]; children are more likely to migrate to cities away from them in the process of rapid urbanization. Therefore, rural elders may feel isolated and lonely. Better social engagement with families, relatives, and friends is helpful for them to stay away from loneliness [32–34]. Positive emotions and satisfaction have been widely acknowledged as particularly important in combating the sense of isolation in the past several years. The lockdown and quarantine implemented for counteracting the COVID-19 pandemic have determined an unprecedented situation of social deprivation, forcing residents to dramatically destroy the opportunities for face-to-face connections. There is an undesirable negative impact looming on psychological well-being when the physical connection is interrupted [35]. A strong social connectedness is vital for people to enjoy happiness and well-being, as it helps to develop the feelings of value and belonging. The emotional support from social contacts enables rural residents to seek companionship and fulfill emotional demands, thus reducing the feeling of isolation. Internet use is a significant way to improve social connectedness, especially for isolated rural residents, whose main purpose of using the internet is to maintain contacts with family and friends [36]. The internet helps them to remove barriers of time and distance. Through the use of the internet and communication technologies such as smartphones, computers, and iPads, rural residents could connect with the outside world more conveniently and keep in touch with their children and friends in neighboring communities with no necessary in-person interactions. Through the internet, they could make more frequent social contacts, gain positive emotions and decrease loneliness, thus achieving a sense of satisfaction [37]. With reduced social exclusion and isolation, as well as expanded social capital, the well-being of the rural residents would be lifted up [38]

The internet is conducive to increasing channels for farmers' information searching. More inclusive market information services become accessible for rural farmers, increasing their farming inputs such as improved seeds and fertilizer [39]. Using the internet reduces farmers' information asymmetry and searching costs, broadens the sales of agricultural products, and facilitates product delivery [27,40–44]. E-commerce platforms such as Tmall,

Taobao and Buy-together (Pin-duo-duo) enable farmers to connect with local and world markets [45]. Connecting urban consumers directly with rural farms significantly improves the sales of agricultural products. Moreover, internet adoption encourages farmers to participate in labor market and work off-farm. Mobile devices facilitate the efficiency of obtaining job-market information and commuting [46,47]. Farmers obtain job vacancy information and wage payments through the internet by clicking the mouse or surfing on their smartphones. E-commerce enables farmers to enlarge the sales market, participate in off-farm employments, or start a business. Rapid-developing online payment tools such as Alipay and WeChat Pay could enhance the remittance from children who work in the cities to their parents or siblings in rural areas [48].

With the fast development of internet technologies, rural residents adopt various applications, which are available from the App Store of smartphones, such as Tik Tok, Wechat, Micro Blog, etc. Rural residents, as well as urban residents, would enjoy watching attractive short videos, having video chats, and communicating online with others. The online activity range of rural residents is as wide as that of their diversified interests. Mobile games have become more and more popular, providing farmers multiple ways to spend leisure time. Farmers now have more learning opportunities through online courses. Rural residents could gain a higher level of life satisfaction as they have easy access to information and various online entertainment services [49].

Above all, internet use exerts a positive impact on social connectedness of rural residents, as well as provides multiple ways to seek information and entertainments [50,51]. Therefore, rural residents' internet use might improve their well-being. In this respect, we predict the following:

Hypothesis 1. *Using the internet improves the sense of subjective well-being of rural residents. Despite the benefits of the internet, the adoption rate is still low in less-developed regions, especially in rural areas [52]. The internet in the western regions, and even in the central regions is likely to be a new thing, so the utilization of it may bring larger marginal effects on rural residents' well-being. Therefore, we predict the following:*

Hypothesis 2. *The impacts of internet use on the well-being of the rural residents from the central and western regions are more significant than those from the eastern regions.*

As a modern technology, the ability of internet use has a threshold effect. Young rural farmers may be more capable than the middle-aged, let alone the elderly, so there may exist heterogeneity among people of different ages. Thus, we predict the following:

Hypothesis 3. *The impact of internet use on the feeling of subjective well-being is significantly different among age stages and younger rural residents benefit more from internet use.*

3. Estimating Methods and Data

3.1. Model and Methodology

3.1.1. Ordered-Logit Model

To investigate the effects of internet use on rural residents' subjective well-being in China, the study estimates the following model:

$$SBJ_i = \alpha_0 + \alpha_1 internet_i + \alpha X_i + \varepsilon_i \quad (1)$$

where SBJ_i is a dummy variable indicating farmers' subjective well-being: when the value is below the critical value $C0$ ($SBJ_i = 0$), farmers are unhappy; when the value is higher than $C0$ but lower than $C1$ ($SBJ_i = 1$), farmers are somewhat happy and so on; when the value is higher than $C9$ ($SBJ_i = 10$), farmers are very happy. The Ologit model is well

suited for the objective of this study as the dependent variable in Equation (1) is an ordered discrete variable. The value of SBJ_i are as shown in Equation (2):

$$SBJ_i = \begin{cases} 0,\ SBJ_i \leq C0 \\ 1,\ C0 \leq SBJ_i \leq 1 \\ \cdots\cdots \\ 10,\ C9 \leq SBJ_i \end{cases} \tag{2}$$

Assuming that ε_i obeys uniform distribution and Λ indicates cumulative distribution function, SBJ_i could be represented as below:

$$\begin{array}{l} \mathrm{P}(SBJ_i = 0) = \Lambda(C0 - X\alpha) \\ \mathrm{P}(SBJ_i = 1) = \Lambda(C1 - X\alpha) - \Lambda(C0 - X\alpha) \\ \cdots\cdots\cdots \\ \mathrm{P}(SBJ_i = 10) = 1 - \Lambda(C9 - X\alpha) \end{array} \tag{3}$$

As the coefficients of Ologit estimation only provide limited information about the significant level and symbols, they are not intuitive. Therefore, the study reports marginal effects of independent variables on $Happiness_i$, calculated as:

$$\partial P(SBJ_i = 10)/\partial X = \alpha\Lambda(C9 - X\alpha) \tag{4}$$

3.1.2. Propensity Score Matching

There might be selection bias of the regression as variables of ability, personal preference, etc., which affect farmers' internet use might be omitted. PSM is able to mitigate selection bias based on observed heterogeneities, so it is used to deal with omitted variable bias. The first step is to estimate the propensity score based on the observable varieties. The Ologit model is utilized to forecast the probabilities of whether farmers will use the internet as follows:

$$\mathrm{P}(X_i) = \mathrm{Pr}(D_i = 1|X_i) \tag{5}$$

The second step is to match the treatment group which includes farmers who use the internet, and the control group which includes farmers who do not use the internet. Therefore, it may act like a random controlled trial and the selection bias could be eliminated. The next step is to compare the differences in farmers' subjective well-being between the treatment group and the control group so that the coefficients of the impact of internet use on farmers' well-being are calculated, which is the Average Treatment Effect on the Treated (ATT). As shown in Equation (6), D_i illustrates the treatment variable that concludes 1 and 0. When $D_i = 1$, it represents the treatment group and $D_i = 0$ means the controlled group. $P(X_i)$ indicates the propensity score. Y_{1i} and Y_{0i} represent the estimation results of the treatment group and the control group, respectively.

$$\begin{array}{l} \mathrm{ATT} = \mathrm{E}[(Y_{1i} - Y_{0i})|D_i = 1] = E\{E[(Y_{1i} - Y_{0i})|D_i = 1], P(X_i)\} \\ \quad = E\{E[Y_{1i}|D_i = 1, P(X_i)] - E[E[Y_{oi}|D_i = o, P(X_i)]|D_i = 1\} \end{array} \tag{6}$$

3.1.3. Endogenous Switching Regression

Subjective well-being is kind of personal mentality and the less happy ones may seek psychological comfort through the internet; happier people may use the internet more frequently as they have a more positive mentality. Therefore, simultaneity bias may exist. As PSM only mitigates selection bias of observed heterogeneities, it does not help when unobservable factors simultaneously affect the outcomes [48], so PSM may also underestimate the effects of internet use on subjective well-being. Therefore, we employ the ESR model which accounts for both observed and unobserved heterogeneities [48]. The procedure of carrying out the ESR regression is as follows: first, the probabilities of whether farmers use the internet are estimated by Ologit; second, the differences in the subjective well-being of the two samples, using and not using the internet, are estimated.

Equation (7) is the selection equation where X_i^* is an unobservable latent variable and when $internet_i^* > 0$, $internet = 1$, which means the farmers use the internet; C_i is a vector of control variables that contains not only the variables in X_i, but also the dummy variable of whether internet is the main information channel; β and θ are parameters to be estimated; μ_i is the random error.

$$internet_i^* = \beta + \theta C_i + \mu_i; internet = 1 \ (internet_i^* > 0) \tag{7}$$

Equations (8) and (9) are the determination equations where SBJ_{1i} and SBJ_{0i} represent the subjective well-being of farmers who use and do not use the internet, respectively. β_1, β_0, δ_1 and δ_0 are coefficients; σ_{1i} and σ_{0i} are random error.

$$SBJ_{1i} = \beta_1 + \delta_1 X_{1i} + \sigma_{1i} \ if \ internet_i = 1 \tag{8}$$

$$SBJ_{0i} = \beta_0 + \delta_0 X_{0i} + \sigma_{0i} \ if \ internet_i = 0 \tag{9}$$

The subjective well-being of farmers who use the internet and who do not use are illustrated by Equations (10) and (11) and the counter-factual models are shown by Equations (12) and (13) as follows:

$$E(SBJ_{1i}|internet_i = 1) = \beta_1 + \delta_1 X_{1i} + \sigma_{1i} \tag{10}$$

$$E(SBJ_{0i}|internet_i = 0) = \beta_0 + \delta_0 X_{0i} + \sigma_{0i} \tag{11}$$

$$E(SBJ_{0i}|internet_i = 1) = \beta_0 + \delta_0 X_{1i} + \sigma_{1i} \tag{12}$$

$$E(SBJ_{1i}|internet_i = 0) = \beta_1 + \delta_1 X_{0i} + \sigma_{0i} \tag{13}$$

The ATT of the subjective well-being of farmers who use the internet is illustrated by the difference of Equations (10) and (12) as follows:

$$\text{ATT} = E(SBJ_{1i}|internet_i = 1) - E(SBJ_{0i}|internet_i = 1) \tag{14}$$

Similarly, the ATT of the subjective well-being of farmers who do not use the internet is illustrated by the difference of Equations (11) and (13) as follows:

$$\text{ATT} = E(SBJ_{1i}|internet_i = 0) - E(SBJ_{0i}|internet_i = 0) \tag{15}$$

3.2. Data and Variable Descriptions

The study utilizes the latest 2018 wave of CFPS covering 25 provinces, collected by Peking University. CFPS is a nationally representative survey of communities, families, and individuals, focusing on residents' socio-economic activities, family relationships, physical and psychological health, and self-reported subjective well-being. The 2010 wave of CFPS is the baseline and the samples have been surveyed from then on permanently. The 2018 wave of CFPS designed detailed questions on individual internet use including the use of mobile equipment and computer, and residents' self-reported subjective well-being, making it representative and authoritative. As our study aims to explore the influences of internet use on the subjective well-being of rural residents, samples who report no internet use are deleted and 13,986 samples of rural households are used in the empirical analysis.

The dependent variable refers to the self-reported subjective well-being of rural residents on an 11-point scale from 0 = very unhappy to 10 = very happy. The key independent variable is whether rural residents use the internet or not (0 = no, 1 = yes).The control variables include age and its squared term, gender, education, marital status, health status and whether the respondent belongs to the Chinese Communist Party (CCP) (0 = no, 1 = yes), according to Grover and Helliwell [14]; Wang and Pan [53]; and Zhu and Ma [54] et al. Table 1 lists the details and statistical descriptions of the variables.

Table 1. Description of the variables in the study.

Variables	Definitions	Obs	Mean	Std. Dev.	Min	Max
Subjective well-being	Self-reported subjective well-being from 0 = very unhappy to 10 = very happy	13,986	7.0017	2.7689	0	10
Internet use	1 if respondent uses the internet in 2018, 0 otherwise	13,986	0.4033	0.4906	0	1
Gender	Gender of respondent: 1 = male, 0 = female	13,986	0.4954	0.5000	0	1
Age	Age of respondent (years)	13,986	48.9261	17.3703	16	100
Age^2	Square term of Age	13,986	2695.4710	1704.7720	256	10,000
Marital status	1 if respondent is married, 0 otherwise	13,986	0.7452	0.4358	0	1
Education	The schooling years of respondent (years)	13,986	6.3905	4.7163	0	22
Health status	1 if the respondent is healthy, 0 otherwise	13,986	2.8875	1.2995	1	5
Political identity	1 if the respondent belongs to the CCP, 0 otherwise	13,986	0.0671	0.2501	0	1
Income	Per-capita net income in logarithmic form	13,986	9.3008	0.9309	5.0106	13.8547

4. Empirical Results

4.1. Empirical Results and Discussion

Table 2 shows the results from Ologit and the model runs well with the R^2 and pseudo-R^2 increasing gradually. The estimation reveals the subjective well-being of rural residents is positively affected by internet use on the 1% confidence level, which confirms Hypothesis 1. The results still hold when control variables and the dummy variable of provinces are included. Internet use provides farmers with various ways for accessing information, such as market information on agricultural products, online entertainments, and online shopping thus effectively improves farmers' well-being. The results are similar to those of David [23]; Zhu and Ma [29]; Jin and Li [5]; and so on.

Table 2. Impact of internet use on rural residents: estimation results of Ologit.

Variables	Ologit		
	(1)	(2)	(3)
Internet use	0.3194 ***	0.0630 ***	0.0740 ***
	(0.0156)	(0.0241)	(0.0244)
Gender		−0.0442 **	−0.0331 *
		(0.0184)	(0.0185)
Age		−0.0250 ***	−0.0264 ***
		(0.0038)	(0.0038)
Age^2		0.0002 ***	0.0002 ***
		(0.0000)	(0.0000)
Marital status		0.7433 ***	0.7355 ***
		(0.0282)	(0.0284)
Education		0.0073 ***	0.0032
		(0.0024)	(0.0025)
Health status		0.1631 ***	0.1565 ***
		(0.0081)	(0.0081)
Political identity		0.0075 *	0.0101 ***
		(0.0038)	(0.0039)
Income		0.0234 **	0.0193 *
		(0.0106)	(0.0111)
Dummy (province)	Uncontrolled	Uncontrolled	Controlled
Constant			
R^2			
Pseudo-R^2	0.0054	0.0312	0.0355
N	16,074	13,986	13,986

Note: ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Gender negatively affects respondents' subjective well-being, suggesting females are happier than males. The possible reason is that male farmers bare greater pressure from both family and work. With increasing age, farmers' subjective well-being first decreases all the way to the nadir then increases, showing a U-shaped trend. The results align with Yu and Fiebig [55] and Zhou et al. [56]. Marital status is an important factor affecting subjective well-being and has the highest positive coefficient among all control variables. Married respondents have higher levels of subjective well-being than those not married. The finding is consistent with Grover and Helliwell [14], using samples from the UK. The possible reason might be that married people are accompanied by their spouses and are less likely to feel lonely. Rural residents with better education are more likely to be happy when using the internet as they tend to have higher employment probability and the capacity to comprehend the contents on internet [57]. Health positively contributes to subjective well-being significantly. Medical payments could be a heavy financial burden for farmers in China [58], so healthier farmers report to be happier. Farmers belonging to the CCP are happier as the identity of CCP members represents political capital as well as social capital, and increases income and invisible earnings. Political status may also provide people with more opportunities for social interactions and participation. The coefficient of per-capita net income is positive on the 5% confidence level, meaning that income is a vital factor in deciding whether farmers are happy or not.

4.2. Results of the Endogenous Test

Although internet use positively affects farmers' subjective well-being, there might exist the problem of endogeneity. The study uses PSM and endogenous switching regression (ESR) model to deal with possible endogeneity.

4.2.1. Results of PSM

Firstly, the propensity scores of samples using the internet and the ones not using internet were matched, and the logit model was run including influencing factors of subjective well-being. Secondly, the propensity scores of rural residents using the internet were estimated according to the results of the model ran on the matched samples. The results of PSM are shown in Table 3. The Average Treatment Effect on the Treated (ATT) of the two samples, using and not using the internet, was calculated. The ATTs of k-nearest neighbor matching, radius matching, kernel matching, local linear regression matching and spline matching all show that internet use significantly improves the subjective well-being of rural residents, although the significance and value of ATTs are slightly different under different matching methods.

Table 3. Results of PSM under different matching methods.

Matching Methods	Sample	Treated	Controls	ATT	S.E.	T-Stat
K-nearest neighbor matching	Unmatched	7.5144	6.6553	0.8591	0.0472	18.21
	Matched	7.51403	6.9639	0.5501	0.0385	14.3
Radius matching	Unmatched	7.5144	6.6553	0.8591	0.0472	18.21
	Matched	7.51403	6.6527	0.8614	0.1129	7.63
Kernel matching	Unmatched	7.5144	6.6553	0.8591	0.0472	18.21
	Matched	7.51403	6.6426	0.8715	0.1024	8.51
Local linear regression matching	Unmatched	7.5144	6.6553	0.8591	0.0472	18.21
	Matched	7.5140	6.6164	0.8977	0.1291	6.95
Spline matching	-	-	-	0.8803	0.1165	7.55

Note: k-nearest neighbor matching takes the form of no replacement; the radius is set to be 0.001 in the radius matching; ATT, standard error and t statistics from the spline matching comes from bootstrap method with 500 iterations.

4.2.2. Results of ESR

The variable of internet use as the main information channel was used as the instrumental variable (IV) in the ESR and the results are shown in Table 4. According to Table 4,

ρ_1 and ρ_2 are significantly different from zero on the 1% level, indicating the presence of sample selection biases in the results of benchmarking regression, which is inferior to those of ESR [59,60]. The ATT and Average Treatment Effect on the Untreated (ATU) were further calculated based on ESR and were compared with those from PSM. The results of PSM come from the ATT obtained from the spline matching of PSM. As shown in Table 5, the ATT and ATU from ESR are 1.9861 and 1.5236, respectively, while the coefficient estimated by Ologit is only 0.074, confirming the presence of selection bias and the underestimation of the effects of internet use on subjective well-being.

Table 4. Results of ESR.

Variables	Selection	Internet Use	
		Users	Non-Users
Gender	0.0648 ***	−0.1309 **	−0.1796 ***
	(0.0308)	(0.0536)	(0.0661)
Age	−0.0065	−0.1096 ***	0.0816 ***
	(0.0072)	(0.0139)	(0.0148)
Age^2	−0.0005 ***	0.0014 ***	−0.0005 ***
	(0.0001)	(0.0002)	(0.0001)
Marital status	0.1537 ***	0.7544 ***	2.9659 ***
	(0.0478)	(0.0817)	(0.0830)
Education	0.0616 ***	0.0076 ***	−0.0066
	(0.0040)	(0.0086)	(0.0089)
Health status	−0.0087	0.3904	0.3722 ***
	(0.0123)	(0.0242)	(0.0239)
Political identity	0.0156 **	0.0016	0.0374 ***
	(0.0067)	(0.0117)	(0.0142)
Income	0.1737 ***	0.0616 *	−0.0195
	(0.0174)	(0.0321)	(0.0344)
Dummy (province)	Controlled	Controlled	Controlled
Constant	−1.6111 ***	7.2214 ***	0.8544 ***
	(0.2169)	(0.4052)	(0.5056)
Internet as the main information channel	1.2769 ***		
	(0.0312)		
ρ_1		−0.1934 ***	
		(0.0417)	
ρ_2			−0.3451 ***
			(0.0425)
N		13,986	

Note: ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 5. ATT of the effects of internet use on subjective well-being of rural residents.

Subjective Well-Being	ATT	ATU	PSM-ATT
Internet use	1.9861 ***	1.5236 ***	0.8803 ***
	(0.0238)	(0.0175)	(0.1165)

Note: *** denote significance at the 10% level.

4.3. Robustness Check

In order to further verify the robustness of the regression results, a series of robustness tests were carried out, including replacing the core explanatory variable, internet use, with internet as the main information channel, and replacing the dependent variable, subjective well-being, with life satisfaction. Furthermore, we notice that some variables have many categories that make analysis difficult and do not provide much information, such as subjective well-being and education. Therefore, we further classify these two variables into four groups based on the relative frequency. Specifically, the four groups of subjective well-being are: 1 = very unhappy, 2 = relatively happy, 3 = relatively happy, and 4 = very

happy. The four groups of education are: 1 = illiteracy, 2 = primary school, 3 = junior high school, and 4 = senior high school and college. The frequency, percent, and cumulative distribution of each group of the two variables are illustrated in Table A1. The statistical description of life satisfaction and newly grouped subjective well-being and education are shown in Table A2.

As shown in Table 6, column (1) shows the results of replacing the initial subjective well-being with the newly grouped one. The results are supportive of the former conclusions that internet use is conducive to improving the subjective well-being of farmers. Column (2) replaces the core explanatory variable, which support the significant positive effect of the internet as the main information channel on rural residents' well-being. Column (3) replaces the dependent variable with life satisfaction and shows that internet use has a significant positive effect on it. Column (4) replaces the core explanatory and dependent variables simultaneously and the results still hold. Therefore, the above results further confirm that the effect of internet use on the subjective well-being of rural residents is robust and credible. In all the columns, the education status shows an upward trend, indicating that farmers with a better educational background tend to be happier when using the internet.

Table 6. Results of robustness check.

	Category_Subjective Well-Being	Subjective Well-Being	Life Satisfaction	Life Satisfaction
	(1)	(2)	(3)	(4)
Internet as the main information channel		0.1710 ***		0.1698 ***
		(0.0221)		(0.0223)
Internet use	0.080 ***		0.0738 ***	
	(0.025)		(0.0245)	
Gender	−0.037 *	−0.0268	−0.0336 *	−0.0329 *
	(0.019)	(0.0187)	(0.0186)	(0.0186)
Age	−0.027 ***	−0.0231 ***	−0.0250 ***	−0.0236 ***
	(0.004)	(0.0039)	(0.0037)	(0.0037)
Age^2	0.000 ***	0.0002 ***	0.0002 ***	0.0002 ***
	(0.000)	(0.0000)	(0.0000)	(0.0000)
Marital status	0.710 ***	0.7390 ***	0.6985 ***	0.6906 ***
	(0.029)	(0.0285)	(0.0283)	(0.0282)
Primary school	0.009	−0.0035	0.0010	−0.0053
	(0.030)	(0.0290)	(0.0288)	(0.0288)
Junior high school	−0.008	−0.0557 *	−0.0268	−0.0510 *
	(0.029)	(0.0286)	(0.0286)	(0.0286)
Senior high school and college	0.126 ***	0.0531	0.0816 **	0.0515
	(0.035)	(0.0334)	(0.0334)	(0.0333)
Health status	0.157 ***	0.1563 ***	0.1569 ***	0.1564 ***
	(0.008)	(0.0081)	(0.0081)	(0.0081)
Political identity	0.117 ***	0.0793 **	0.0833 **	0.0784 **
	(0.037)	(0.0349)	(0.0348)	(0.0349)
Income	0.028 **	0.0149	0.0214 *	0.0182 *
	(0.012)	(0.0110)	(0.0110)	(0.0110)
Dummy (province)	Controlled	Controlled	Controlled	Controlled
Pseudo-R^2	0.0512	0.0366	0.0331	0.0340
N	13,986	13,986	13,986	13,986

Note: ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

5. Further Discussion

5.1. Influencing Mechanism

How does internet use affect rural residents' well-being? The study explores the influencing mechanism by replacing internet use with the frequency of online study, online social interaction, and online entertainment. The results of the Ologit model are shown

in Table 7. The frequency of online study has the highest coefficient, 0.0408, compared to the other two. As a kind of capital accumulation, internet use can create a sense of self-cognition and psychological satisfaction in the process of obtaining information and rich knowledge. Online social interaction contributes to farmers' subjective well-being as it brings more social connectedness through online chatting. Leisure and entertainment activities are both important factors affecting farmers' subjective well-being. The internet provides online video, games, music, and other leisure activities which can help people to release pressure and enjoy life, to satisfy their spirit, which has been manifested by previous studies [57].

Table 7. Mechanism analysis of internet use on subjective well-being of farmers.

	Subjective Well-Being of Farmers		
	(1)	**(2)**	**(3)**
Frequency of online study	0.0408 ***		
	(0.0053)		
Frequency of online social interaction		0.0191 ***	
		(0.0044)	
Frequency of online entertainment			0.0126 ***
			(0.0045)
Gender	−0.0311 *	−0.0320 *	−0.0335 *
	(0.0185)	(0.0185)	(0.0185)
Age	−0.0237 ***	−0.0252 ***	−0.0263 ***
	(0.0038)	(0.0038)	(0.0038)
Age^2	0.0002 ***	0.0002 ***	0.0002 ***
	(0.0000)	(0.0000)	(0.0000)
Marital status	0.7528 ***	0.7358 ***	0.7373 ***
	(0.0285)	(0.0284)	(0.0284)
Education	0.0003	0.0026	0.0033
	(0.0025)	(0.0025)	(0.0025)
Health status	0.1571 ***	0.1565 ***	0.1566 ***
	(0.0081)	(0.0081)	(0.0081)
Political identity	0.0091 **	0.0100 ***	0.0104 ***
	(0.0039)	(0.0039)	(0.0039)
Income	0.0186 *	0.0170	0.0189 *
	(0.0111)	(0.0112)	(0.0112)
Dummy (province)	Controlled	Controlled	Controlled
Pseudo-R^2	0.0362	0.0356	0.0355
N	13,986	13,986	13,986

Note: ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

5.2. Heterogeneity

The above analysis obtains the average effect of internet use on farmers' subjective well-being but does not distinguish the effects on different sample groups. In fact, due to various economic development levels and geographical environments in rural areas, the human capital and social capital of different sample groups are diverse in the initial motivation of internet use. The impact factors of internet use on the subjective well-being of rural residents might be quite different. Therefore, this study further divides rural residents by region (i.e., eastern, central and western regions (The eastern region includes 11 provinces, i.e., Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan; the central region includes 9 provinces, i.e., Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan; and the western region includes Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Ningxia, Qinghai, Xinjiang, and Guangxi.)) and age (i.e., young as under 40 years old, middle-aged as between 40 and 60 years old, and elder as over 60 years old) to investigate the heterogeneity, in order to reach more detailed and meaningful conclusions, which are shown in Table 8.

Table 8. Heterogeneity analysis of internet use on subjective well-being of farmers.

	Region			Age		
	Eastern Region	**Central Region**	**Western Region**	**Young**	**Middle-Aged**	**Elderly**
Internet use	0.0266	0.0816 *	0.0897 **	0.3643 ***	0.0640 **	0.0936
	(0.0444)	(0.0465)	(0.0370)	(0.0528)	(0.0314)	(0.0714)
Gender	−0.0681 **	−0.0285	−0.0310	−0.0084	−0.0522 *	−0.1865 ***
	(0.0325)	(0.0341)	(0.0303)	(0.0322)	(0.0299)	(0.0380)
Age	−0.0216 ***	−0.0212 ***	−0.0298 ***	−0.1474 ***	−0.1444 ***	0.3912 ***
	(0.0069)	(0.0069)	(0.0061)	(0.0231)	(0.0477)	(0.0492)
Age^2	0.0002 ***	0.0002 ***	0.0002 ***	0.0023 ***	0.0014 ***	−0.0028 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0004)	(0.0005)	(0.0003)
Marital status	0.7653 ***	0.8322 ***	0.6326 ***	0.5221 ***	0.8774 ***	1.0106 ***
	(0.0507)	(0.0537)	(0.0449)	(0.0513)	(0.0606)	(0.0463)
Education	0.0017	0.0074	0.0016	0.0179 ***	0.0002	0.0061
	(0.0047)	(0.0048)	(0.0038)	(0.0053)	(0.0039)	(0.0045)
Health status	0.1897 ***	0.1776 ***	0.1212 ***	0.1966 ***	0.1673 ***	0.1533 ***
	(0.0143)	(0.0146)	(0.0134)	(0.0164)	(0.0124)	(0.0139)
Political identity	0.0075	0.0178 **	0.0078	−0.0047	0.0067	0.0165 ***
	(0.0073)	(0.0071)	(0.0060)	(0.0080)	(0.0059)	(0.0062)
Income	0.0276	0.0170	−0.0015	−0.0119	0.0649 ***	0.0287
	(0.0179)	(0.0207)	(0.0179)	(0.0206)	(0.0176)	(0.0176)
Dummy (province)	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Pseudo-R^2	0.0346	0.0377	0.0247	0.0247	0.0285	0.0654
N	4518	4191	5082	4350	5526	4110

***Note*:** ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Internet use positively affects farmers' subjective well-being in the central and western regions at the 10% and 5% confidence levels, respectively. Specifically, in rural areas of Central and Western China, the probabilities of rural residents using the internet improving the subjective well-being are 8.16% and 8.97% higher than those not using the internet, respectively. The results suggest the existence of a digital divide caused by regional differences. On the one hand, the economic development and natural resource endowments are imbalanced among different regions. The economy in the eastern region is more advanced and the internet has been popular for many years. Thus, using the internet does not significantly affect the subjective well-being of eastern residents. In the central and western regions, due to the relatively slow economic development and weak internet infrastructure, internet use of rural residents started late, and is even still quite fresh. On the other hand, using the internet to obtain rich information resources and video resources brings a stronger sense of achievement and satisfaction to local residents, especially in the remote areas of Central and Western China. The finding confirms Hypothesis 2.

In terms of age, the impact of internet use on well-being of the elderly is not statistically significant. However, internet use has significant positive effects on the subjective well-being of the young and middle-aged people at the 1% and 5% confidence level, respectively. The probabilities of subjective well-being gained by young and middle-aged people who use the internet are higher by 36.4% and 6.4%, respectively, compared to those who do not use the internet. The results show that the effect of internet use on subjective well-being for young people is the strongest among all sub-samples, which confirms Hypothesis 3.

6. Conclusions and Policy Implications

Subjective well-being is the ultimate goal of people's life. Farmers occupy a large proportion of the total population and their subjective well-being is important to general subjective well-being and social harmony in China. This study investigates the effects of internet use on farmers' subjective well-being based on the 2018 wave of CFPS data, using multiple estimation methods including Ologit, PSM, and ESR. The following findings are emerging. First, internet use has a positive and statistically significant effect on the farmers'

subjective well-being. After addressing the endogeneity issue, the findings are robust. Second, the frequency of online study, online social interaction, and online entertainment are important channels affecting farmers' well-being. Third, subjective well-being effects of internet use are heterogeneous among respondents. The benefits of using the internet are higher for rural residents from the central and western regions than those from the eastern regions. Young and middle-aged users are happier than older ones.

Based on the above findings, we put forward the following policy implications. First, the positive impact of internet use on farmers' subjective well-being highlights the importance of government policies aiming at rural information and communication technology (ICT). Although more than 98% of China's administrative villages have access to optical fiber and 4G, the internet penetration rate in rural areas is 58.8% as reported by the Statistical Report on the Development of China's Internet issued by CNNIC. This means that rural people have access to the internet but may lack the ability to use it as they are either of low income or are not able to use smart phones or computers. Therefore, the diffusion of ICT should be a part of the social support program sponsored by the state especially in areas of low income levels, such as the provision of low-cost cell phones and talk time free-of-charge. Apart from the hard infrastructure, soft ones are also suggested as a complement. Efforts should also be made to strengthen the propaganda training projects of internet use in rural areas to improve the cognition and capacity of farmers to use the internet. Online study, online social interaction and online entertainment should be promoted among rural residents that subsequently improve their well-being.

Internet access has a more significant effect on farmers' subjective well-being in Central and Western China than that in the eastern regions. This implies that there is no Matthew effect of the beneficial effect of internet in different regions, which provides important opportunities for the less developed regions to chase the eastern regions. Therefore, the government needs to prioritize the construction of ICT infrastructures, especially in the central and western regions, and provide more broadband services to eliminate the digital division. Moreover, social capital should be conducted to expand ICT in the central and western areas as a complementarity for the financial fund for the ICT infrastructure construction, to fulfill the balanced development among various regions.

As older internet users gain less enhancement in subjective well-being than younger ones, more attention should be paid to the well-being of the elderly. Due to the low education levels, elders in rural areas rarely adopt internet use, causing a low adoption rate. Therefore, training programs designed especially for the elders are required. The government should also encourage the participation of the elderly in the training programs. Instructors need to be patient when communicating with the elderly and teach them hand-in-hand when necessary as some elder people may have a lower level of practical abilities. Moreover, technology companies should simplify the interfaces to cater to the needs of the elders. It is also necessary to optimize the interfaces of internet terminal devices for older rural adults.

In general, the internet use of rural residents in China is still in its initial stage. The problems such as "extensive coverage of new infrastructure but low level of rural residents' internet use" in western rural areas of China restrict the development of rural electronic business and the digital governance platforms. To make the huge amount of new infrastructure investment in the poor areas of Western China play a greater role, on the one hand, policy makers should firmly promote inclusive internet use training, e-commerce operation training, and the digital governance platform in rural areas to improve the development basis of internet-based assistance in rural areas. On the other hand, we should give full attention to the leading role of the typical demonstration of the "e-commerce poverty alleviation model village" and "digital governance model village". In addition, whether inclusive internet use, e-commerce operation training, and access to digital governance platforms are mediating the impact of internet use on rural people's subjective well-being may be of strong practical value, which is the focus of future research.

Author Contributions: Methodology, X.S.; Software, H.Z.; Investigation, X.Z.; Writing—original draft, J.W.; Writing—review & editing, C.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by The 2021 High-end Science and Technology Innovation Think Tank Youth Project of China (2021ZZZLFZB1207128); Science and Technology Innovation Project of Chinese Academy of Agricultural Sciences (CAAS-ASTIP-2016-AII; JBYW-AII-2022-37\12); National key projects for basic scientific research funds of research Institutes of China (JBYW-AII-2022-35).The APC was funded by The 2021 High-end Science and Technology Innovation Think Tank Youth Project of China (2021ZZZLFZB1207128).

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Kinshasa School of Public Health ethical committee (ref: ESP/CE/149/2021).

Informed Consent Statement: Informed consent was obtained from the participants involved in the study.

Data Availability Statement: The dataset of this study can be made available on reasonable request to Sun, X.

Acknowledgments: We thank all individuals who participated in this study and especially the entire survey team for their support in this study.

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

Appendix A

Table A1. Frequency, percent and cumulative distribution of newly grouped subjective well-being and education.

Variables	Group	FrEquation	Percent	Cum.
Subjective well-being	1 = very unhappy	2167	13.48	13.48
	2 = relatively unhappy	2915	18.13	31.62
	3 = relatively happy	6035	37.55	69.16
	4 = very happy	4957	30.84	100
Education	1 = illiteracy	3982	28.12	28.12
	2 = primary school	3047	21.52	49.64
	3 = junior high school	4390	31	80.64
	4 = senior high school and college	2742	19.36	100

Table A2. Statistical description of the variables used in the robustness check.

Variable	Obs	Mean	Std. Dev.	Min	Max
Category_subjective well-being	13,986	2.9241	0.9545	1	4
Category_education	13,986	2.4178	1.0915	1	4
Life satisfaction	13,986	3.8772	1.1803	1	5
Internet as the main information channel	13,986	0.4605	0.4985	0	1

References

1. Trilar, J.; Kos, A.; Jazbinšek, S.; Jensterle, L.; Duh, E.S. ICT to Promote Well-Being within Families. *Sensors* **2018**, *18*, 2760. [CrossRef] [PubMed]
2. Kokubun, K.; Ogawa, T.; Browne, R.; Shinada, T.; Granrath, L.; Moeller, J.; Tram, N.; Wieching, R.; Taki, Y. Social Capital Mediates the Association between the ICT Usage and Well-Being of Older People in Japan: Implication for a New Design Paradigm. *Sustainability* **2022**, *14*, 4148. [CrossRef]
3. Kim, J.; Estrada, G.; Jinjarak, Y.; Park, D.; Tian, S. ICT and Economic Resilience during COVID-19: Cross-Country Analysis. *Sustainability* **2022**, *14*, 15109. [CrossRef]
4. Stofkova, J.; Poliakova, A.; Stofkova, K.R.; Malega, P.; Krejnus, M.; Binasova, V.; Daneshjo, N. Digital Skills as a Significant Factor of Human Resources Development. *Sustainability* **2022**, *14*, 13117. [CrossRef]

5. Jin, H.; Li, L.; Qian, X.; Zeng, Y. Can rural e-commerce service centers improve farmers' subject well-being? A new practice of 'internet plus rural public services' from China. *Int. Food Agribus. Manag. Rev.* **2020**, *23*, 681–695. [CrossRef]
6. Mergel, I. Social media institutionalization in the U.S. federal government. *Gov. Inf. Q.* **2016**, *33*, 142–148. [CrossRef]
7. Zhang, T.; Yu, L. The Relationship between Government Information Supply and Public Information Demand in the Early Stage of COVID-19 in China—An Empirical Analysis. *Healthcare* **2022**, *10*, 77. [CrossRef]
8. Easterlin, R.A. Does Economic Growth Improve the Human Lot? Some Empirical Evidence. In *Nations & Households in Economic Growth*; Academic Press: Cambridge, MA, USA, 1974; pp. 89–125.
9. Stevenson, B.; Wolfers, J. Economic Growth and Subjective Well-Being: Reassessing the Easterlin Paradox. In *Brookings Papers on Economic Activity*; Brookings Institution Press: Washington, DC, USA, 2008.
10. Brzezinski, M. Top Incomes and Subjective Well-being. *J. Econ. Psychol.* **2019**, *73*, 60–65. [CrossRef]
11. Hitt, L.; Tambe, P. Broadband adoption and content consumption. *Inf. Econ. Policy* **2007**, *19*, 362–378. [CrossRef]
12. Mishra, A.K.; Williams, R.P.; Detre, J.D. Internet Access and Internet Purchasing Patterns of Farm Households. *Agric. Resour. Econ. Rev.* **2009**, *38*, 240–257. [CrossRef]
13. Blanchflower, D.G.; Oswald, A. Money, Sex and Happiness: An Empirical Study. *Scand. J. Econ.* **2004**, *106*, 393–415. [CrossRef]
14. Grover, S.; Helliwell, J.F. How's Life at Home? New Evidence on Marriage and the Set Point for Happiness. *J. Happiness Stud.* **2019**, *20*, 373–390. [CrossRef]
15. Stutzer, A.; Frey, B.S. Does Marriage Make People Happy, or Do Happy People Get Married? *J. Socio-Econ.* **2006**, *35*, 326–347. [CrossRef]
16. Takashi, O.; Kayo, N.; Miki, K. Relative Income and Happiness in Asia: Evidence from Nationwide Surveys in China, Japan, and Korea. *Soc. Indic. Res.* **2010**, *104*, 351–367.
17. Welsch, H. Environment and happiness: Valuation of air pollution using life satisfaction data. *Ecol. Econ.* **2006**, *58*, 801–813. [CrossRef]
18. Zhang, X.; Zhang, X.; Chen, X. Happiness in the Air: How Does a Dirty Sky Affect Mental Health and Subjective Well-being? *J. Environ. Econ. Manag.* **2017**, *85*, 81–94. [CrossRef]
19. Mitchell, M.; Lebow, J.; Uribe, R.; Grathouse, H.; Shoger, W. Internet use, happiness, social support and introversion: A more fine grained analysis of person variables and internet activity. *Comput. Hum. Behav.* **2011**, *27*, 1857–1861. [CrossRef]
20. Bruni, L.; Stanca, L. Watching alone: Relational goods, television and happiness. *J. Econ. Behav. Organ.* **2008**, *65*, 506–528. [CrossRef]
21. Gui, B.; Stanca, L. Happiness and relational goods: Well-being and interpersonal relations in the economic sphere. *Int. Rev. Econ.* **2010**, *57*, 105–118. [CrossRef]
22. Franzen, A. Social Capital and the Internet: Evidence from Swiss Panel Data. *Kyklos* **2010**, *56*, 341–360. [CrossRef]
23. Quintana, D.; Cervantes, A.; Sáez, Y.; Isasi, P. Internet use and psychological well-being at advanced age: Evidence from the English longitudinal study of aging. *Int. J. Environ. Res. Public Health* **2018**, *15*, 480. [CrossRef] [PubMed]
24. Chen, Y. Internet use among young and older adults: Relation to psychological well-being. *Educ. Gerontol.* **2002**, *28*, 731–744. [CrossRef]
25. Erickson, J.; Johnson, G.M. Internet Use and Psychological Wellness during Late Adulthood. *Can. J. Aging* **2011**, *30*, 197–209. [CrossRef] [PubMed]
26. Sims, T.; Reed, A.E.; Carr, D.C. Information and Communication Technology Use Is Related to Higher Well-Being Among the Oldest-Old. *J. Gerontol.* **2016**, *72*, 761–770. [CrossRef] [PubMed]
27. Ma, W.; Nie, P.; Zhang, P.; Renwick, A. Impact of Internet use on economic well-being of rural households: Evidence from China. *Rev. Dev. Econ.* **2020**, *24*, 503–523. [CrossRef]
28. Ma, W.; Wang, X. Internet Use, Sustainable Agricultural Practices and Rural Incomes: Evidence from China. *Aust. J. Agric. Resour. Econ.* **2020**, *64*, 1087–1112. [CrossRef]
29. Zhu, Z.; Ma, W.; Leng, C. ICT Adoption, Individual Income and Psychological Health of Rural Farmers in China. *Appl. Res. Qual. Life* **2020**, *17*, 71–91. [CrossRef]
30. Dalmaso, M.; Castelli, L.; Galfano, G. Increased gaze cueing of attention during COVID-19 lockdown. *iScience* **2021**, *24*, 103283. [CrossRef]
31. Ren, Q.; Treiman, D.J. Living arrangements of the elderly in China and consequences for their emotional well-being. *Chin. Sociol. Rev.* **2015**, *47*, 255–286. [CrossRef]
32. Khalaila, R.; Vitman-Schorr, A. Internet use, social networks, loneliness, and quality of life among adults aged 50 and older: Mediating and moderating effects. *Qual. Life Res.* **2017**, *27*, 479–489. [CrossRef]
33. Szabó, Á.; Allen, J.; Stephens, C.; Alpass, F.M. Longitudinal Analysis of the Relationship Between Purposes of Internet Use and Well-being Among Older Adults. *Gerontologist* **2019**, *59*, 58–68. [CrossRef] [PubMed]
34. Yang, R.; Wang, H.; Edelman, L.S.; Tracy, E.L.; Demiris, G.; Sward, K.A.; Donaldson, G.W. Loneliness as a mediator of the impact of social isolation on cognitive functioning of Chinese older adults. *Age Ageing* **2022**, *49*, 599–604. [CrossRef] [PubMed]
35. Sibley, C.G.; Greaves, L.M.; Satherley, N.; Wilson, M.S.; Overall, N.C.; Lee, C.H.J.; Milojev, P.; Bulbulia, J.; Osborne, D.; Milfont, T.L.; et al. Effects of the COVID-19 Pandemic and Nationwide Lockdown on Trust, Attitudes towards Government, and Wellbeing. *Am. Psychol.* **2022**, *75*, 618–630. [CrossRef] [PubMed]

36. Yuan, H. Internet use and mental health problems among older people in shanghai, China: The moderating roles of chronic diseases and household income. *Aging Ment. Health* **2020**, *25*, 657–663. [CrossRef] [PubMed]
37. Chen, Y.-R.R.; Schulz, P.J. The effect of information communication technology interventions on reducing social isolation in the elderly: A systematic review. *J. Med. Internet Res.* **2016**, *18*, e18. [CrossRef]
38. Quan-Haase, A.; Mo, G.Y.; Wellman, B. Connected seniors: How older adults in East York exchange social support online and offline. Information. *Commun. Soc.* **2017**, *20*, 967–983. [CrossRef]
39. Wicaksono, M.G.S.; Suryani, E.; Hendrawan, R.A. Increasing productivity of rice plants based on IoT (Internet Of Things) to realize Smart Agriculture using System Thinking approach. *Procedia Comput. Sci.* **2022**, *197*, 607–616. [CrossRef]
40. Aker, J.C.; Mbiti, I.M. Mobile phones and economic development in Africa. *J. Econ. Perspect.* **2010**, *24*, 207–232. [CrossRef]
41. Hübler, M.; Hartje, R. Are smartphones smart for economic development? *Econ. Lett.* **2016**, *141*, 130–133. [CrossRef]
42. Ding, J.P.; Li, J.H.; Liu, J.H.; Zhang, W.F.; Jia, X.P. ICT-based agricultural advisory services and nitrogen management practices: A case study of wheat production in China. *J. Integr. Agric.* **2022**, *21*, 13.
43. Leng, C.; Ma, W.; Tang, J.; Zhu, Z. ICT adoption and income diversification among rural households in China. *Appl. Econ.* **2020**, *52*, 3614–3628. [CrossRef]
44. Brown, P.; Roper, S. Innovation and networks in New Zealand farming. *Aust. J. Agric. Resour. Econ.* **2017**, *61*, 422–442. [CrossRef]
45. Yu, H.; Cui, L. China's e-commerce: Empowering rural women. *China Q.* **2019**, *238*, 418–437. [CrossRef]
46. Avom, D.; Dadegnon, A.K.; Igue, C.B. Does digitalization promote net job creation? Empirical evidence from WAEMU countries. *Telecommun. Policy* **2021**, *45*, 102215. [CrossRef]
47. Hartje, R.; Hübler, M. Smartphones support smart labour. *Appl. Econ. Lett.* **2017**, *24*, 467–471. [CrossRef]
48. Ma, W.; Grafton, R.Q.; Renwick, A. Smartphone use and income growth in rural China: Empirical results and policy implications. *Electron. Commer. Res.* **2018**, *20*, 713–736. [CrossRef]
49. Alshakhsi, S.; Chemnad, K.; Almourad, M.B.; Altuwairiqi, M.; McAlaney, J.; Ali, R. Problematic internet usage: The impact of objectively Recorded and categorized usage time, emotional intelligence components and subjective happiness about usage. *Heliyon* **2022**, *8*, e11055. [CrossRef]
50. Li, L.; Du, K.; Zhang, W.; Mao, J.-Y. Poverty alleviation through government-led e-commerce development in rural China: An activity theory perspective. *Inf. Syst. J.* **2019**, *29*, 914–952. [CrossRef]
51. Qi, J.; Zheng, X.; Cao, P.; Zhu, L. The effect of e-commerce agribusiness clusters on farmers' migration decisions in China. *Agribusiness* **2019**, *35*, 20–35. [CrossRef]
52. Cheng, O. *Inclusive Growth and e-Commerce: China's Experience*; AliResearch: Hangzhou, China, 2018.
53. 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]
54. Zhu, Z.; Ma, W.; Leng, C.; Nie, P. The Relationship Between Happiness and Consumption Expenditure: Evidence from Rural China. *Appl. Res. Qual. Life* **2020**, *16*, 1587–1611. [CrossRef]
55. 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]
56. Zhou, Z.; Mao, F.; Ma, J.; Hao, S.; Qian, Z.; Elder, K.; Turner, J.; Fang, Y. A longitudinal analysis of the association between living arrangements and health among older adults in China. *Res. Aging* **2018**, *40*, 72–97. [CrossRef] [PubMed]
57. Kim, D. Cross-National Pattern of Happiness: Do Higher Education and Less Urbanization Degrade Happiness? *Appl. Res. Qual. Life* **2018**, *13*, 21–35. [CrossRef]
58. Frijters, P.; Beatton, T. The mystery of the U-shaped relationship between happiness and age. *J. Econ. Behav. Organ.* **2012**, *82*, 525–542. [CrossRef]
59. Lokshin, M.; Sajaia, Z. Maximum likelihood estimation of endogenous switching regression models. *Stata J.* **2004**, *4*, 282–289. [CrossRef]
60. Li, J.; Zhou, X. Internet use and Chinese older adults' subjective well-being (SWB): The role of parent-child contact and relationship. *Comput. Hum. Behav.* **2021**, *119*, 106725. [CrossRef]