



The Impacts of Digital Literacy on Citizen Civic Engagement—Evidence from China

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The use of information and communication technologies and the internet is becoming more and more important in people's lives. The ability to make use of these technologies turns out to be a new kind of literacy—digital literacy. Besides, engaging in civic life is a basic citizen right. As a form of civic engagement, political participation is largely shaped by the use of internet and online communities. We expect that digital literacy offers people capabilities to speak out their viewpoints in online spaces. Using data from China collected in 2017, we investigate empirically the relationship between digital literacy and individual online political participation. We measure online political participation as online rights protection for oneself and for others. Estimation results show a positive and significant effect of digital literacy on online political participation. For those who care about news and those who believe that the government workers pay attention to the public's thoughts online, the impact of digital literacy is larger than that for the general population. We propose that lack of digital literacy is a barrier for people to participate in online political activities in China. We also suggest policies for promoting digital literacy.

CCS Concepts: • **Social and professional topics** → **Computer supported cooperative work**;

Additional Key Words and Phrases: Digital literacy, civic engagement, political participation

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1 INTRODUCTION

During the past three decades, the use of **information and communication technologies (ICTs)** and the internet has been becoming more and more important in people's lives. Digitalization gives people opportunities to apply digital tools to search and acquire information, learn knowledge, share thoughts, and communicate ideas.

Irrespective of huge benefits resulting from digitalization, people are not equally benefiting from it Manovich [2002]. People show differences in competences. Having access to digital devices and the internet is not the key aspect for people to effectively engage in the digitalized world. The ability to make use of ICTs and the internet turns out to be a new kind of literacy—digital literacy. Digital literacy covers more than the basic skills to manipulate a digital device.

In a civilized world, engaging in the civic life is basic citizen right. Abbas and Nawaz [2014] proposed that civic engagement is the ways in which citizens join in the life of a community to ameliorate circumstances of others

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and to help mold the community's future. Political participation is a form of civic engagement. Chatora [2012] noted that political participation means various mechanisms through which the public convey their political standpoints and thus enforce their impact on political processes.

Nowadays, civic engagement and political participation are largely shaped by the use of internet and online communities. For instance, social media offer people forums that make it easier for the public to gather together and discuss and comment on social issues. Some researchers claim that digital technologies and social media stimulate political knowledge and discussion [Ostling 2010].

In addition to social media, citizens can engage in public affairs through other forms of online communities, like government portals. The **United Nations (UN)** has been conducting e-government surveys in its member states. Two important indexes used are **E-Government Development Index (EGDI)** and **E-Participation Index (EPI)**. According to the results of the UN evaluation in 2016, China ranked 63rd in the world for EGDI and 22nd for EPI [UN 2016]. In 2018, EGDI ranked 65th and EPI ranked 29th [UN 2018]. According to the most recent assessment in 2020, EGDI jumped to 45th and EPI to 9th [UN 2020].

As stated by the UN, the EGDI presents the state of E-Government Development, whilst the EPI is a qualitative assessment based on the availability and relevance of participatory services on government websites. The EGDI and EPI are not intended as absolute measurements of e-participation. With the ranks of China in EGDI and EPI ascending rapidly from 2016 to 2020, we will ask in this article, apart from government mechanism, what are the internal factors that impact on individual civic engagement and political participation.

Confronting social media and government portals, we expect that digital literacy offer people with capabilities to speak out their viewpoints in the public. The objective of the article is to investigate the relationship between digital literacy and individual online political participation. We measure online political participation as online rights protection for oneself and for others.

The rest of the article is arranged like this: Section 2 reviews previous literature concerning digital literacy, online participation, and relations between them. Section 3 presents data source, sample selection, variable definitions, and basic statistics. Section 4 builds up the econometric models and gives estimation results. Section 5 offers conclusions.

2 LITERATURE REVIEW

According to Preece [2000], an online community is composed of people interacting socially, of regulations to guide these interactions, and of digital systems to facilitate gathering together. Perez [2013] noted that the principal functions of online communities are information exchange, social interactions, and political deliberation.

Digital literacy, which covers technological skills and others skills, acts as prerequisite people should have to participate in online communities. Steinmann et al. [2005] pointed out that if online platforms are too complicated, their use may be obstructive for those with low technological skills. Santini and Carvalho [2019] indicated that solutions found to promote online political participation and ensure its effectiveness involve shaping the platform design according to people's abilities.

2.1 The Concept of Digital Literacy

There are studies devoted to defining the concept of digital literacy. Jones and Flannigan [2006] noted that digital literacy reflects a people's capacity to accomplish tasks efficiently in the digital environment; Literacy contains the ability to read and comprehend media, to create data and images via digital operations, and to assess and utilize knowledge obtained from the digital world. Ng [2013] proposed that digitally literate people should have technical and operational skills, the ability to think critically, and be able to use the internet properly to communicate. European Commission [2018] defined several essential components: to search for and acquire digital information and content, to communicate and cooperate via digital technologies, to create digital content; to protect personal privacy, and so on. Kazakov [2019] argued that media literacy is the ability of an individual

to locate the information that he/she is interested in from media materials, to critically comprehend it, as well as to create media messages purposively.

To sum up, we conclude in this article that digital literacy at least covers the following abilities and skills: operational skills with digital devices; cognitive skills such as reading, comprehending, and evaluating digital contents; thinking critically about the information provided by digital media; creating new contents and share thoughts on the digital media; communicating and collaborating with others on the internet.

2.2 Factors Affecting Active Online Community Participation

Nevertheless, possessing digital literacy does not necessarily lead to active participation in online communities. Several factors are effective when people decide their extent of engagement.

The first set of factors consists of individual differences. Amichai-Hamburger [2007] found that introverted individuals display more extroverted behavior online than they would when dealing with others face to face. Cullen and Morse [2011] showed that individuals high in agreeableness were encouraged by helping others in online communities. Gangadharbatla [2008] indicated that the level of Internet self-efficacy is positively correlated with participation in social networking sites, where Internet self-efficacy refers to beliefs in one's capabilities to execute actions on the Internet. Fletcher and Park [2017] found that those do not trust in news media are prone to use non-mainstream news sources and are more likely to engage in online news participation.

Second, social-group processes affect online community participation. The needs for attachment and belonging usually cause individuals to commit to participating [Sassenberg 2002]. Reciprocity is regarded as the belief that current contributions will result in future requests being met, which advocates online community participation [Kankanhalli et al. 2005]. Besides, active participants are impelled by the benefit of receiving a title or acknowledgment.

Thirdly, policy environment of online communities influences the level of participation. Participants often cite not having enough privacy and safety in online communities as a common reason for their reluctance to actively participate in discussions [Nonnecke and Preece 2000]. Nov et al. [2013] suggested that anonymity and invisibility can make online communication a more attractive channel for the introverted.

2.3 Factors Influencing Online Political Participation

In this article, we concern individual online political participation, i.e., online rights protection for oneself and for others. Although digital literacy does not guarantee active online political participation, there are a few factors that can be encouraging.

First, some people believe that the Internet could help the underprivileged to get their voice heard in the virtual space [Howard and Hussain 2011]. Studies conducted in countries where Internet censorship exists found that online posting behavior was predicted by the belief that the Internet could empower them politically [Shen et al. 2009]. Second, the cost of online participation is relatively low. Advantages attached to online discussion forums could be the alleviation of spatial, temporal and financial barriers compared to traditional non-digital forums [Klein 1999]. Thus, we expect that once people are equipped with digital literacy, they are likely to engage in active online political participation.

Nevertheless, we have to admit that there are special issues associated with mainland China. Inglehart and Welzel [2010] pointed out that Confucius states are most low on self-expression scale, which prevents people from expressing themselves online. Shen and Liang [2015] noted that Internet censorship may deter people from actively participating in political discussions online. Jiang and Xu [2009] analyzed web features on 31 provincial government portals and pointed out that the government resorts to more subtle forms of online control through information delivery, agenda setting, and containment of public dissent.

In all, on the one hand, people are motivated by the belief in the political empowerment of the Internet and low costs of online engagement. On the other hand, the special environment in China may restrain people from

active participation. The aim of this article is to investigate empirically the relation between digital literacy and active online political participation.

Studies that are closely related with this article usually find a positive relationship between digital literacy and civic engagement. Abbas and Nawaz [2014] put forward that digital literacy is positively correlated with political membership and voting activities among Pakistan university students. Moon and Bai [2020] examined the effects of different components of digital literacy on civic engagement among Korean teenagers. They found that information usage has a significant impact on posting on social issues.

2.4 Contributions of the Current Article

The article contributes to the current literature in three aspects. First, we intend to quantitatively estimate the relation between digital literacy and individual online political participation in the context of China. As a country with rapid developments in digitalization, it makes sense to examine its people's levels of digital literacy and online political participation. Second, we measure online political participation as online rights protection for oneself and for others. Last, we look at the effect of digital literacy for different people groups depending on their levels of news attention and depending on whether they believe that government workers pay attention to the public's thoughts online. We expect that digital literacy has a greater impact on those who pay more attention to news. We also expect that digital literacy has a greater impact on those who believe in the internet for attracting the government workers' attention.

3 DATA AND SAMPLE SELECTION

3.1 The China General Social Survey Data

The data we employ in this article are collected by the **China General Social Survey (CGSS)**. Since 2003, CGSS has executed surveys of around 10,000 households in mainland China every year or every two years. Data collected by the CGSS are cross sectional. The surveys have covered nearly all province-level administrative units and included information on demographic characteristics, educational attainment, marital status, health condition, work status, income, social activities, social attitudes, internet use, and so on. Since the survey done in 2017 provides information on individual digital skills and online political participation, we use data from the survey done in 2017. We refer to this survey as CGSS 2017 hereafter.¹

3.2 Sample Selection

Respondents of the CGSS are people who are aged 16 years old or above. There are initially 12,582 respondents interviewed by CGSS 2017. We look at both rural and urban residents. We restrict our estimation sample to people who are aged between 16 and 65. After dropping observations whose values are missing in the key variables we concern, there are 3,194 respondents left in our ultimate estimation sample. We mention this sample as the benchmark sample in the following of this article.

3.3 Variable Definitions

In this article, we examine three outcome variables that reflect an individual's political participation. The first variable is the frequency with which the individual uses the internet for the purpose of protecting his/her rights or other people's rights in the past year. The frequency takes values from 1 to 5, meaning never, few times, sometimes, often and always. The second variable is a dummy indicating whether the individual would resort to the internet to protect his/her rights when his/her rights were infringed. Specifically, the variable takes value 1 if the individual would resort to the internet and 0 otherwise. The third variable is a dummy showing whether the individual would support others online when others appeal to the internet to protect their rights when their

¹To obtain the data, please see <http://cnsda.ruc.edu.cn/index.php?r=projects/view&id=94525591>. The data are publicly accessible and free.

rights were infringed. Specifically, the variable takes value 1 if the individual would support others online and 0 otherwise.

The independent variable we focus on refers to an individual's level of digital literacy. We build an index based on several variables, which represent individual digital skills and competences. We look at three aspects of individual digital skills and competences. The first aspect covers six basic skills, namely, knowing how to open websites on a computer, knowing how to download and install an application on a smart phone, finding it not difficult to search for and find information needed, verifying first the authenticity of a message when reading a message retransmitted by others on social media, knowing how to operate to express opinions on the internet, and verifying first the safety of the environment before making a payment on the internet. Each of these skills is denoted by a dummy variable.

The second aspect includes two dummy variables: actively protecting one's personal privacy online and worrying about that one's personal privacy will be leaked on the internet.

The third aspect contains two dummy variables relating to the use of social networking applications: having used Wechat and having used QQ. Unfortunately, CGSS 2017 do not give information about the frequencies of using Wechat and QQ. Wechat and QQ are the two most popular social networking tools in current China. People can use these tools to communicate, to share and exchange thoughts, to post words, pictures and videos, to retransmit and comment on messages and articles, and so on. However, CGSS 2017 do not provide information on what kinds of activities the individuals use Wechat and QQ for.

Based on the aforementioned ten variables, we construct a single index of digital literacy by averaging the values of the ten variables following the method applied in previous studies [Hargittai 2005]. Larger values of the index indicate higher levels of individual digital literacy.

Apart from outcome variables and the key independent variable, we also consider some explanatory variables in the empirical analysis to control for possible estimation biases. We include individual characteristics in regressions, namely, gender, age, educational attainment, whether being married or not, number of kids, whether having a local registration (so-called Hukou in China), annual income, health status, whether belonging to a minority group, and whether living in the urban. The gender variable indicates whether the individual is a male. Age is measured in years. Educational attainment variable takes values from 1 to 13, indicating the lowest to the highest educational levels. Annual income is measured in ten thousand. Health status variable takes values from 1 to 5, representing the worst to the best health conditions. Besides, we control for fixed effects at the province level.

To check whether the relationship between digital literacy and political participation varies according to people's characteristics, we further carry out empirical analyses by looking at subgroups of people. First, we would like to see if the relationship between digital literacy and political participation is strengthened when focusing on people who care about news. Specifically, we examine people who read news at least one hour per day. Second, we would like to see if the relationship gets larger when focusing on people who believe in the internet for attracting the attention of the government. Specifically, we concentrate on people who believe that government workers pay attention to the public's thoughts online.

3.4 Descriptive Statistics

In the benchmark sample, there are around 22.6% of respondents sometimes, often or always use the internet for the purpose of protecting his/her or other people's rights in the past year. There are approximately 26.4% of respondents would resort to the internet to protect his/her rights when his/her rights were infringed and approximately 23.2% of respondents would support others online when others appeal to the internet to protect their rights. About the key independent variable, i.e., the index of digital literacy, the average value of the index is 3.56.

Based on the benchmark sample, we summarize in Table 1 independent variables by different values of the dependent variables. We distinguish two subsamples in columns 1 and 2 according to the frequency with which the individual uses the internet for the purpose of protecting his/her or other people's rights. We give in column 1

Table 1. Descriptive Statistics

	Frequency of online participation		Protect oneself online		Support others online		Entire sample
	Low (1)	High (2)	No (3)	Yes (4)	No (5)	Yes (6)	(7)
Digital literacy	3.52	3.99	3.22	3.86	3.24	3.89	3.56
Gender	0.49	0.52	0.48	0.50	0.47	0.51	0.49
Age in years	40.6	33.6	47.7	36.5	47.7	35.4	40.1
Education attainment	6.62	7.75	4.88	7.53	4.91	7.76	6.71
Married	0.77	0.59	0.82	0.68	0.82	0.67	0.76
Number of kids	0.64	0.56	0.61	0.48	0.67	0.46	0.63
Has a local Hukou	0.61	0.56	0.71	0.56	0.71	0.55	0.60
Annual income	4.35	5.53	3.87	5.5	3.99	5.63	4.61
Health status	3.50	3.98	3.45	3.96	3.46	4.00	3.81
Minority status	0.06	0.07	0.08	0.07	0.08	0.07	0.07
Live in the urban	0.64	0.75	0.60	0.78	0.61	0.79	0.70
Number of observations	2,470	724	2,350	844	2,436	758	3,194

Note: We use data from CGSS2017. Benchmark sample consists of people who are aged between 16 and 75 years old. Sample means of relevant variables that are computed from the benchmark sample are reported in the table.

sample means of the independent variables when the frequency variable is less than 4 and in column 2 those when the frequency variable is equal to or larger than 4. Two subsamples are distinguished in columns 3 and 4 according to whether the individual would resort to the internet to protect his/her rights when his/her rights were infringed. Similarly, two subsamples are distinguished in columns 5 and 6 according to whether the individual would support others online when others appeal to the internet to protect their rights. Finally, figures in column 7 is from the entire benchmark sample.

As we can see, people with higher levels of digital literacy are more likely to frequently use the internet for the purpose of protecting his/her or other people's rights in the past year, more likely to resort to the internet to protect his/her rights when his/her rights were infringed, and more likely to support others online when others appeal to the internet to protect their rights.

Concerning other control variables, it seems that the male, the younger people, the better educated, those who are unmarried, those with fewer kids, those without a local registration, those with higher incomes, those who are healthier, and those living in the urban show higher probabilities in participating in online political activities.

Since descriptive statistics can only give us preliminary results about the relationships between the dependent and the independent variables, it is thus necessary to implement econometric analyses to obtain better understandings.

4 ESTIMATION MODELS AND RESULTS

4.1 The Econometric Models

We structure two econometric models in this section. One is to assess factors that potentially influence individual levels of digital literacy. Another is to evaluate the relationship between individual digital literacy and online political participation.

We first construct the following linear model:

$$Digital_i = \alpha_0 + \alpha'X_i + u_i, \quad (1)$$

where i denote an individual. The dependent variable *Digital* refers to the level of digital literacy. As defined in Section 3.3, we build a single index based on several variables, which reflect individual digital skills and competences.

Table 2. Factors Affecting Individual Digital Literacy

	Dependent variable: Digital Literacy
Gender	0.062** (0.030)
Age in years	−0.013*** (0.000)
Education attainment	0.052*** (0.000)
Married	−0.054 (0.158)
Has a local Hukou	−0.026 (0.433)
Annual income	0.002* (0.097)
Health status	0.044*** (0.002)
Minority status	−0.019 (0.732)
Live in the urban	−0.028 (0.430)
Used internet for 5 years	0.376*** (0.000)
Uses internet for 5 hours per week	0.130*** (0.000)
Living in provinces in central region	0.047 (0.228)
Living in eastern provinces	0.124*** (0.004)
Province fixed effects	Yes
Number of observations	3,194

Note: We use data from CGSS2017. Benchmark sample consists of people who are aged between 16 and 75 years old. Estimation results of Equation (1) are in the table. Coefficient estimates and p-values in parentheses are reported. ***, **, and * denote significance at 1%, 5%, and 10% level, respectively.

Vector X includes individual characteristics, namely, gender, age, educational attainment, whether being married or not, whether having a local registration, annual income, health status, whether belonging to a minority group, whether living in the urban, and experiences of using the internet. To measure internet experience, we use two variables: whether the individual has used the internet for at least five years and whether the individual uses the internet at least five hours per week. We have checked that after redefining the first experience variable to be “The individual has used the internet for at least three years,” the estimation results in Table 2 only vary slightly. We have also checked that after redefining the second experience variable to be “The individual uses the internet at least three hours per week,” the estimation results in Table 2 only change slightly. We also use two dummies to indicate whether the individual lives in the eastern and coastal provinces and whether the individual lives in provinces of the central region. u_i is the random error term.

To estimate Equation (1), we employ an **ordinary least square (OLS)** estimator.

We second build the following linear model:

$$Partic_i = \beta_0 + \beta_1 * Digital_i + \beta'Z_i + \varepsilon_i, \quad (2)$$

where i denote an individual. The dependent variable *Partic* denotes individual online political participation. As mentioned in Section 3.3, we employ three measures to reflect this participation. The first variable is the frequency with which the individual uses internet to protect his/her or other people's rights in the past year. The second variable indicates whether the individual would resort to the internet to protect his/her rights when his/her rights were infringed. The third variable shows whether the individual would support others online when others appeal to the internet to protect their rights.

The key independent variable *Digital* is the level of digital literacy. The coefficient of interest of this article is β_1 . A positive estimate of β_1 implies that the higher the level of digital literacy is, the more likely the individual will participate in online political activities defined in this article.

Vector Z contains other explanatory variables mentioned in Section 3.3. In particular, we include in Z individual characteristics and fixed effects at province level. Specifically, individual characteristics refer to gender, age, educational attainment, whether being married or not, number of kids, whether having a local registration, annual income, health status, whether belonging to a minority group, and whether living in the urban. Fixed effects at province level refer to a series of dummy variables each of which represents a province of China. Our benchmark sample covers 28 provinces, and we include 27 dummies to reflect fixed effects at the province level. ε_i is the random error.

To estimate Equation (2), we apply an OLS estimator. The authors have also estimated Equation (2) using a Probit model. Estimation results are quite similar to those obtained using an OLS estimator in terms of magnitude and significance of coefficient estimates. We conclude that a linear probability model—OLS estimator—gives similar results to a nonlinear probability model—Probit model. We first estimate the equation using the entire benchmark sample. Then, to check if the relationship between digital literacy and online political participation varies for different people groups, we estimate the equation using several subsamples.

4.2 Factors Affecting Individual Level of Digital Literacy

In this section, we assess factors that may affect individual level of digital literacy. We primarily look at individual characteristics. Estimation results of Equation (1) are in Table 2.

As we can see, the males seem to significantly show higher levels of digital literacy than the females. Older people are less good at digital literacy than the young. Better education enables people with higher levels of digital literacy. Higher income and better health conditions are positively correlated with digital literacy. The two variables of internet use experience positively affect digital literacy level, implying that the more an individual uses internet, the higher level of digital literacy an individual can achieve.

Finally, people living in provinces in the central region are with higher levels of digital literacy than people living in western provinces, but the difference is not statistically significant. People living in eastern and coastal provinces are with higher levels of digital literacy than people living in western provinces, and the difference is highly significant.

4.3 The Effect of Digital Literacy on Online Political Participation

In this section, we estimate Equation (2) using the entire benchmark sample. Estimation results are in Table 3. The dependent variable in column 1 is the frequency with which the individual uses internet to protect his/her or other people's rights. The dependent variable in column 2 is whether the individual would resort to the internet to protect his/her rights when his/her rights were infringed. The dependent variable in column 3 is whether the individual would support others online when others appeal to the internet to protect their rights.

As we can see in column 1, digital literacy has a positive and significant impact on the frequency of online political participation. In other words, the higher the level of digital literacy is, the more often the individual will use the internet to protect his/her or other people's rights.

Now let's look at results in column 2. Digital literacy has a positive and significant effect on the probability that the individual would resort to the internet to protect his/her rights when his/her rights were infringed.

Table 3. Effects of Digital Literacy on Civic Engagement

	Frequency of online participation	Protect oneself online	Support others online
	(1)	(2)	(3)
Digital literacy	0.367*** (0.000)	0.083*** (0.000)	0.067*** (0.000)
Gender	0.017 (0.679)	0.017 (0.286)	0.005 (0.744)
Age in years	-0.012*** (0.000)	-0.007*** (0.000)	-0.008*** (0.000)
Education attainment	0.013*** (0.005)	0.022*** (0.000)	0.022*** (0.000)
Married	-0.009 (0.882)	-0.007 (0.773)	-0.002 (0.917)
Number of kids	-0.064** (0.028)	-0.017** (0.038)	-0.012* (0.091)
Has a local Hukou	-0.026 (0.547)	-0.015 (0.394)	-0.016 (0.341)
Annual income	-0.001 (0.291)	-0.002 (0.556)	-0.002 (0.463)
Health status	0.017 (0.425)	0.012 (0.127)	0.011 (0.179)
Minority status	0.046 (0.569)	0.008 (0.803)	0.010 (0.736)
Live in the urban	0.052 (0.328)	0.025 (0.204)	0.020 (0.276)
Province fixed effects	Yes	Yes	Yes
Number of observations	3,194	3,194	3,194

Note: We use data from CGSS2017. Benchmark sample consists of people who are aged between 16 and 75 years old. Estimation results using the benchmark sample of Equation (2) are given in the table. Coefficient estimates and p-values in parentheses are reported. ***, **, and * denote significance at 1%, 5%, and 10% level, respectively.

Estimation results in column 3 imply that digital literacy has a positive and significant effect on the likelihood that the individual would support others online when others appeal to the internet to protect their rights.

Thus, we think that lack of digital literacy plays as a barrier for peoples to participate in online political activities.

About other controls, younger people are more likely to participate in online political activities, which is true for all of the three measures of online political participation. Besides, people with higher education levels and people with fewer kids are more likely to participate in online political activities. People having more kids may have a tight schedule and do not have much time to participate in political activities.

4.4 The Effect of Digital Literacy on Online Political Participation for Different Subgroups

In this section, we estimate Equation (2) using four subsamples of the benchmark sample, i.e., people who read news at least one hour per day, people who do not do so, people who believe that the government workers pay attention to the public's thoughts online, and people who do not believe it.² We expect that for people who

²We have checked that after redefining the “people who are concerned about news” as the “people who read news at least two hours per day,” the estimation results in Table 4 vary slightly.

Table 4. Effects of Digital Literacy on Civic Engagement: Different Subgroups

	Frequency of online participation	Protect oneself online	Support others online
	(1)	(2)	(3)
The general population	0.367 ^{***} (0.000)	0.083 ^{***} (0.000)	0.067 ^{***} (0.000)
Individuals concerning about news	0.437 ^{***} (0.000)	0.156 ^{***} (0.000)	0.133 ^{***} (0.000)
Individuals not concerning about news	0.251 ^{***} (0.003)	0.062 ^{***} (0.002)	0.051 ^{***} (0.002)
Individuals believing in the internet	0.408 ^{***} (0.000)	0.188 ^{***} (0.000)	0.173 ^{***} (0.000)
Individuals not believing in the internet	0.233 ^{***} (0.004)	0.074 ^{***} (0.006)	0.058 ^{***} (0.008)

Note: We use data from CGSS2017. We look at four subsamples of the benchmark sample, i.e., individuals who read news at least one hour per day, individuals who do not, individuals who believe that the government workers pay attention to the public's thoughts online, and individuals who do not. Estimation results of Equation (2) using the four subsamples are given in the table. Coefficient estimates and p-values in parentheses of the digital literacy variable are reported. Other control variables include gender, age in years, education attainment, marital status, number of kids, has a local Hukou, annual income, health status, minority status, live in the urban and province fixed effects. ***, **, and * denote significance at 1%, 5%, and 10% level, respectively.

concern about news there is a stronger relationship between digital literacy and online political participation than that for those who do not. Similarly, for people who believe in the internet in attracting the government's attention, there is a stronger relationship between digital literacy and online political participation than that for those who do not.

Estimated coefficients of the digital literacy variable are given in rows 2 to 5 of Table 4. For comparison, we list in row 1 the estimated coefficient of the digital literacy variable using the benchmark sample, which represents the general population.

The dependent variable in column 1 of Table 4 is the frequency with which the individual uses internet to protect his/her or other people's rights. The one in column 2 is whether the individual would resort to the internet to protect his/her rights when his/her rights were infringed. The one in column 3 is whether the individual would support others online when others appeal to the internet to protect their rights.

As we can see in row 2, for individuals concerning about news, digital literacy has a positive and significant influence on each of the three dependent variables. As expected, for each of the three dependent variables, the magnitude of the effect is larger than that of the general people shown in row 1.

Looking at row 3, we observe that for those not concerning about news, digital literacy has a positive and significant effect on each of the three dependent variables. However, for each of the three dependent variables, the magnitude of the effect is smaller than that of the general population.

For individuals believing in the internet, digital literacy has a positive and significant impact on each of the three dependent variables. As expected, for each of the three dependent variables, the magnitude of the effect is larger than that of the general people.

As to those not believing in the internet, digital literacy shows a positive and significant effect for each of the three dependent variables. But the magnitude of the effect is smaller than that of the general population in all three columns.

To sum up, we propose that, once equipped with digital literacy, people who concern about news and people who believe in the internet in attracting the government's attention are more likely to engage in online political activities than the general population.

According to the 42nd Statistical Report on the Development of China's Internet [2018], there are around 0.611 million non-netizens by the end of 2017 in China. Lack of Internet skills and low levels of literacy are two main barriers to using the Internet. Besides, there are approximately 0.646 billion online news users by the end of 2017. Based on the data from CGSS 2017, 42% of people aged between 16 and 65 read news at least one hour per day. Among those who read news, 26% are with a level of digital literacy below the sample average. When confronted with the question, "Do you believe that government workers pay attention to the public's thoughts online," 69% of people aged between 16 and 65 answer "Yes." Among those who answer "Yes," 37% are with a level of digital literacy below the sample average. We conjecture that there is potential for people to engage in online political activities once they are equipped properly with digital literacy.

5 CONCLUSIONS

During the last three decades, the use of ICTs and the internet has been becoming more and more important in people's lives. The ability to make use of ICTs and the internet turns out to be a new kind of literacy—digital literacy.

In a civilized world, engaging in the civic life is basic citizen right. Political participation is a form of civic engagement. Political participation is largely shaped by the use of internet and online communities. Researchers claim that digital technologies and social media stimulate political knowledge and discussion.

We expect that digital literacy can provide people with capabilities to speak out their viewpoints in public. Using data from China collected by a nationwide survey in 2017, we investigate empirically the relationship between digital literacy and people's online activities of political participation. We measure online political participation as online rights protection for oneself and for others. Estimation results show a positive and significant effect of digital literacy on people's online political participation. For those who read news at least one hour per day and those who believe that the government workers pay attention to the public's thoughts online, the impact of digital literacy is larger than that for the general population. In all, we propose that lack of digital literacy is a significant barrier for people to participate in online political activities in China. Equipping people with digital literacy can improve people's online political participation.

We have also investigated factors that affect individual levels of digital literacy. We find that internet use experience is positively associated with the level of digital literacy. We suggest that digital literacy is something can be achieved through training. Moreover, we discover that people from eastern provinces are with higher levels of digital literacy than those from western provinces. Giving the regional disparities, regional gap-bridging policies should be aimed at reducing the gap between the eastern and western regions.

The **European Union (EU)** countries have already been promoting digital inclusion policies for more than 10 years. China can learn from practices by the EU. Digital inclusion is an effort within the EU to ensure that everyone can contribute to and benefit from the digital world. In 2010, the EU publishes the Digital Agenda for Europe. Policies for digital inclusion encourage greater use of the Internet, increase broadband coverage, and promote digital literacy. In 2016, the European Commission adopted a new Skills Agenda that seeks to promote a number of actions to ensure that the right training, the right skills, and the right support is available to people in the EU so that they are equipped with skills that are needed in a modern working environment.

REFERENCES

- Z. Abbas and A. Nawaz. 2014. Digital-Literacy as the predictor of political-participation a survey of university graduates in Dikhan, KP, Pakistan. *Global J. Hum.-Soc. Sci. F: Poli. Sci.* 14 (2014).
- Y. Amichai-Hamburger. 2007. Personality, individual differences, and internet use. In *Oxford Handbook of Internet Psychology*, A. Joinson, K. Y. A. McKenna, T. Postmes, and U. D. Reips (Eds.). Oxford University Press, Oxford, UK, 187–204.
- A. Chatora. 2012. Encouraging political participation in Africa the potential of social media platforms. Retrieved on October 9, 2022 <https://www.africaportal.org/publications/encouraging-political-participation-in-africa-the-potential-of-social-media-platforms/>.
- China Internet Network Information Center. 2018. The 42nd Statistical Report on the Development of China's Internet. Retrieved October 9, 2022 <https://cnnic.cn/n4/2022/0401/c88-767.html>.

- R. Cullen and S. Morse. 2011. Who's contributing? Do personality traits influence the level and type of participation in online communities? In *Proceedings of the 44th Hawaii International Conference on System Science*. IEEE, 1–11.
- European Commission. 2018. Human Capital Digital Inclusion and Skills: Digital Economy and Society Index Report 2018 Human Capital. European Commission, Brussels. Retrieved October 9, 2022 https://ec.europa.eu/information_society/newsroom/image/document/2018-20/2_desi_report_humancapital_B5DC055D-DD1E-51CD-229138BE55F9AE8A_52247.pdf.
- R. Fletcher and S. Park. 2017. The impact of trust in the news media on online news consumption and participation. *Dig. Journal*. 5, 10 (2017), 1281–1299.
- H. Gangadharbatla. 2008. Facebook me: Collective self-esteem, need to belong, and internet self-efficacy as predictors of the iGeneration's attitudes toward social networking sites. *J. Interact. Advert.* 8, 2 (2008), 5e15.
- E. Hargittai. 2005. Survey measures of web-oriented digital literacy. *Soc. Sci. Comput. Rev.* 233 (2005), 371–379.
- P. N. Howard and M. M. Hussain. 2011. The role of digital media. *J. Democ.* 22, 3 (2011), 35–48.
- R. Inglehart and C. Welzel. 2010. Changing mass priorities: The link between modernization and democracy. *Perspect. Politics* 8, 2 (2010), 551–567.
- M. Jiang and H. Xu. 2009. Exploring online structures on Chinese government portals: Citizen political participation and government legitimacy. *Soc. Sci. Comput. Rev.* 27, 2 (2009), 174–195.
- B. R. Jones-Kavalier and S. L. Flannigan. 2008. Connecting the digital dots: Literacy of the 21st Century. *Teach. Librar.-Seattle* 353 (2008), 13.
- Q. Kankanhalli, B. C. Y. Tan, and K.-K. Wei. 2005. Contributing knowledge to electronic knowledge repositories: An empirical investigation. *MIS Quart.* 29, 1 (2005), 113–143.
- A. A. Kazakov. 2019. *Political Theory and Practice of Media Literacy*. Saratov University Publishing House, Saratov, Russia.
- H. Klein. 1999. Tocqueville in cyberspace: Using the internet for citizen associations. *Info. Soc.* 15, 4 (1999), 213–220.
- L. Manovich. 2002. *The Language of New Media*. MIT Press, Cambridge, MA.
- S. J. Moon and S. Y. Bai. 2020. Components of digital literacy as predictors of youth civic engagement and the role of social media news attention: The case of Korea. *J. Child. Media* 144 (2020), 458–474.
- W. Ng. 2013. *Empowering Scientific Literacy Through Digital Literacy and Multiliteracies*. Nova Science Publishers, New York, NY.
- B. Nonnecke and J. Preece. 2000. Lurker demographics: Counting the silent. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM Press, 73–80.
- O. Nov, O. Arazy, C. López, and P. Brusilovsky. 2013. Exploring personality-targeted UI design in online social participation systems. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'13)*. 361–370.
- A. Ostling. 2010. ICT in politics: From peaks of inflated expectations to voids of disillusionment. *Eur. J. e-Pract.* 91 (2010).
- J. Preece. 2000. *Online Communities: Designing Usability, Supporting Sociability*. Wiley, New York, NY.
- O. Perez. 2013. Open government, technological innovation and the politics of democratic disillusionment: (e-)democracy from Socrates to Obama. *J. Law Policy Info. Soc.* 9, 1 (2013), 61–138.
- R. M. Santini and H. Carvalho. 2019. The rise of participatory despotism: A systematic review of online platforms for political engagement. *J. Info. Commun. Ethics Soc.* 17, 4 (2019), 422–437.
- K. Sassenberg. 2002. Common bond and common identity groups on the Internet: Attachment and normative behavior in on-topic and off-topic chats. *Group Dynam.: Theory, Res. Pract.* 6, 1 (2022), 27e37.
- F. Shen and H. Liang. 2015. Cultural difference, social values, or political systems? Predicting willingness to engage in online political discussion in 75 societies. *Int. J. Public Opin. Res.* 27, 1 (2015), 111–124.
- F. Shen, N. Wang, Z. S. Guo, and L. Guo. 2009. Online network size, efficacy, and opinion expression: Assessing the impacts of Internet use in China. *Int. J. Public Opin. Res.* 21, 4 (2009), 451–476.
- R. Steinmann, A. Krek, and T. Blaschke. 2005. Can online map-based applications improve citizen participation? *E-Gov.: Toward Electr. Dem.* 34, 16 (2005), 25–35.
- United Nations. 2016. *UN e-Government Survey 2016: E-Government in Support of Sustainable Development*. United Nations, New York, NY.
- United Nations. 2018. *UN e-Government Survey 2018: Gearing e-Government to Support Transformation Toward Sustainable and Resilient Societies*. United Nations, New York, NY.
- United Nations. 2020. *UN e-Government Survey 2020: Digital Government in the Decade of Action for Sustainable Development*. United Nations, New York, NY.

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