

Digital divide in the adoption and use of the Internet in everyday life: Comparative study in rural and urban Middle China

Abstract

Contemporary China has seen a proliferation of Information and Communication Technologies (ICTs). Mobile technologies have fuelled internet development with their pervasive use among rural and migrant Chinese populations. Previous research has primarily focused on the internet's disruptive role in challenging the Chinese authority of Party-state or on the co-evolution of Chinese civil society and government. However, it is unclear without substantial empirical evidence how the rapid development of ICTs influences the routine and mundane lives of ordinary Chinese people, and whether there is adoption or use gap in ICT adoption and use among different demographic groups. By using a mixed methods design to collect data from multiple field sites, we aim to understand how the internet has been adopted and adapted into the everyday lives of rural and urban Chinese residents and explore whether there is a digital divide in the adoption and after-access use of ICTs. Qualitative interviews reveal the mechanisms behind digital gaps among different demographic groups. The triangulation of quantitative and qualitative methods informs each other and together will contribute valuable insights to the study of ICTs in developing countries.

Keywords: ICTs, digital divide, adoption gap, use gap, mixed methods approach

1. Introduction

Informatisation (*xinxihua* 信息化) is the advancement of an economy and society through the development of information and communication technologies (Qiang, 2009). Informatisation has been prioritised by the central Chinese government as a national strategy for techno-economic development since the late 1990s. Rural informatisation was introduced in 2006 to stimulate rural development. Through the top-down approach of informatisation, the central Chinese government has played a dominant role in the rapid construction of a rural information infrastructure. One project exemplified the state's commitment to penetrating ICTs. However, the other side of informatisation, informational skills and digital capabilities of users, are less important than infrastructure in the national informatisation strategy.

1.1 Bottom-up informatisation: Grassroots adoption and use of ICTs in everyday life.

The central government's top-down approach overemphasises infrastructure and fails to tailor localised services for rural internet users. China currently has two distinct information societies: a rapidly expanding urban information society, and a rural society that follows far behind urban China in ICT development. Mobile devices, meanwhile, help to level the uneven distribution of internet access by providing affordable and convenient internet access to the rural population. With the increasing computing power of smartphones, mobile devices are no longer just communication tools for making phone calls and sending messages but can also be used to accomplish complex tasks.

Seeing the potential of mobile devices in the diffusion of ICTs, many scholars are optimistic about the role of the mobile internet in improving people's well-being in developing countries (Ling & Donner, 2009). However, some research suggests that the information gap between different groups of internet users can hardly be solved by simply introducing affordable and flexible wireless internet. For example, Napoli and Obar (2014) argue that the mobile phone is inferior to the desktop computer in many aspects, including low technological

capabilities and poor platform designs (Napoli & Obar, 2014). From a user perspective, they argue, there is a contrast between desktop computers, which enable active production of content, for example, as against mobile phones, which are restricted to more passive consumption of content (see also Donner 2015). Yet critiques of the mobile internet might also underestimate the potential of digital innovations in designing equivalent functions on mobile devices and on desktops. However, they rightly warn policymakers about the gap between mobile access and internet usage, and between macro-level policy design and micro-level ICT adoption.

1.2 Digital divide in adoption and use of ICTs in China

Empirical studies on digital divide have suggested adoption (Van Dijk & Hacker, 2003; Goldfarb & Prince, 2008), use (DiMaggio & Hargittai, 2001), participation (Hargittai & Walejko, 2008; Shaw & Hargittai, 2018) and information divide in the domestication of ICTs. The diffusion of ICTs in China first started in urban areas in China (Yang, 2013), but the development of mobile technologies has accelerated the proliferation of ICTs in China. Some scholars documented the positive social consequences of ICT development. For example, Murphy (2010) showed the use of ICTs to maintain trans-local social networks of the rural migrant population. She also observed that farmers used online information to help the family business. However, the existing rural-urban dichotomy in internet infrastructure and socioeconomic development has prevented rural residents from accessing high-end technologies. Cartiers, Castells and Qiu (2005) categorised part of the population as ‘information have-less’, which means it only has access to inexpensive devices and uses very basic functions on mobile phones. Wallis’s (2013) study on female migrant workers in Beijing shows that mobile phones have led to an ‘immobile mobility’. Female migrant workers maintain close connections with families by using mobile phones, but their use of mobile devices is limited to phone calls and messages because of a lack of digital competency or literacy skills (Wallis, 2013). Similarly, Oreglia (2014) noticed that although rural families

incorporated ICTs in their everyday lives, ICTs have not fundamentally changed farming practices. She found that local farmers rarely used the internet to seek agricultural information or to learn new farming techniques.

Donner (Donner, 2015) systematically analysed the use of the mobile internet in developing countries. He suggests that the features and functions of the mobile internet can both fuel the penetration of internet access and pose new challenges for digital inclusion. He proposed an ‘after access lens’ to consider the increasing divergence in internet devices, quality of the connection, affordability of connection and digital skills. The after-access lens is of importance in the research of rural Chinese ICTs because the use of the internet has already proliferated to developing areas in the country and there have been few studies that compare the social impact of different types of internet access. Yu (2010), who studied informational stratification by examining the everyday lives of information poor Chinese. She defined the information poor ‘based on their experience as information agents rather than social or economic agents’ (p. 907).

1.3 Research objectives and questions

Research Question 1: Do information technologies exacerbate social cleavages, or do they bridge the pre-existing digital divide?

Research Question 2: Apart from socioeconomic factors, what other barriers account for information disadvantage?

2. Method

2.1 Multisite fieldwork: rural and industrial communities in Middle China

The 15-month fieldwork was divided in three parts: before entering the field sites and starting data collection in two field sites, we spent four months in the summer of 2016 in the county centre, Happy Valley, to familiarise myself to the culture, language, and economic life of the area. A pilot survey was also circulated during this period. The first part of fieldwork was

conducted in Fossil Village between the summer and autumn of 2017, and the second fieldwork conducted in Western factory from late 2017 to the spring of 2018¹.

2.2 Mixed methods approach: Triangulation of quantitative and qualitative data

In this project, we used a mixed methods approach to collect different type of data on everyday information-seeking practices. The mixed methods approach has emerged in recent years as a distinctive methodological framework in social science research (Greene, 2008; Tashakkori & Teddlie, 2003). It involves the application of both quantitative and qualitative methods in a single project (Creswell, 2013). The mixed methods approach also requires “connections, integration, or linking” (p. 50) of two perspectives, more than simply collecting two sets of data (Creswell, 2015). Mixing of two methodological traditions therefore is reflected in every step of research design, including but not limited to research procedures, sampling methods, data validity, and presentation of results.

2.3 Quantitative methods: Survey

We collected a random sample from the total population within each field site. At the first stage, each community was divided into different strata according to either the production teams or factory departments. At the second stage, within each stratum, a random sample of individuals was selected to participate in the survey. The survey in this project includes questions on the following topics: 1) Importance and trust of various information resources online and offline; 2) Importance of different categories of information; 3) Adoption and use of ICTs (including desktop computer and mobile phone); 4) Level of engagement in different Internet activities; 4) Demographic information. All survey data is first translated and coded in SPSS (Version 25). All data analysis is conducted in R.

¹ Names of the village and the factory are pseudonyms to protect the identity of informants in the study

2.4 Qualitative methods

Fossil Village. 74 survey respondents were willing to join in the interviews. Based on their representativeness in terms of age, gender, education background, and internet use variables, we selected 25 villages to participate in the structured interviews. Each interview lasted 30 to 45 minutes. *Western Factory.* 91 out of 228 survey respondents explicitly expressed their willingness to participate in the followed-up qualitative studies in Western Factory, which means we could have a larger sample for interviews compared to the first phase of my fieldwork. Based on descriptive analysis of survey sample, we chose 30 survey respondents who are representative of different groups according to the above-mentioned variables and invited them to participate in individual interviews. After finishing the first round of interviews, we checked the transcripts of interviews and identified questions that entail more varieties or findings that need further investigation. Four focus group studies, each consisting of four participants from different groups, were conducted to check if data saturation has been reached. The combination of both sample descriptive data and saturation as criteria for selecting a sample or qualitative research ensures the data covers diversified groups of individuals as well as that it reaches enough depth for the research topic.

3. Descriptive data analysis: Demographics, adoption and use of ICT

3.1 Demographics of rural and urban samples

Table 2 shows descriptive statistics of demographic variables, including age, gender, marital status, whether one has at least one child, education level, monthly disposable income, whether one has migrant experience, location of migrant experience, time spent working outside as migrant workers. Respondents in the urban sample are in average younger than those in the rural sample. Both samples have higher percentage of female than male participants and contain primarily married individuals who have at least one child. The majority of rural participants have education level at Middle school or below, whereas more than half of the urban participants have received education at occupational school or even undergraduate level. It is interesting that monthly disposable income does not statistically differ between rural and urban participants, with an average income around 2335.45 yuan, higher than China's average per capita disposable income of 1077.67². There are higher percentage of rural participants who have worked as migrant workers compared to urban participants. More than half of the rural migrant workers have worked in first tier cities such as Beijing, compared to only 25.64 per cent among the urban migrants. Rural migrant workers also tend to spend longer time working outside than their urban counterparts.

3.2 Adoptions of ICTs device and the Internet

Table 3 shows the summary statistics of variables related to the adoption of ICTs among rural and urban residents. The penetration rate of computer and mobile phone devices in the rural sample has reached 41.66 and 96.09 per cent respectively. The adoption rate of computer is, however, 94.20 per cent in urban China, and all the surveyed urban residents has mobile phone. There is a higher proportion of mobile-only users, those who depend solely on mobile phone

² http://www.chinadaily.com.cn/business/2017-07/17/content_30140898.htm

as ICT device, in rural than urban China. Two-thirds of surveyed rural residents has mobile Internet access, compared to 100 per cent among urban residents. Internet users, including PC and mobile Internet, account for 74.22 per cent of surveyed rural residents, whereas all the surveyed urban residents use the Internet. Descriptive data suggests that there is an adoption gap between rural and urban China in the adoption of ICT devices and the Internet.

3.3 ICT experience and online engagement

We used years of using PC or mobile phone as measurements of technology experience: Rural PC users are less experienced than urban PC users; however, there is no statistical difference in mobile experience between rural and urban mobile phone users ($t(210) = -0.46, p = .60$). Online engagement in everyday life is operationalised by time spent online per day in the survey: Rural Internet users spend less hours online than their urban counterparts ($t(200) = -3.7, p < .001$). Among the users of ICT devices, there is also rural-urban differences in experience in using technologies and online engagement. Relationships between Internet adoption, experience, and engagement will be explored in next session. A 5-point Likert Scale is used to measure respondents' engagement in various online activities, with scales ranging from "Never use", "Rarely use", "Occasionally use", "Frequently use", to "Use every time I am online". Table 4 compares mean score of engagement in each online activity by rural and urban Internet users and shows the t-test statistics for independence between residence (rural or urban) and online engagement. Figure 2 visualises engagement in online activities using summary statistics of percentage of different scales. Both the table and the figure show that rural users are less engaged in almost all Internet activities compared to urban Internet users, except for social media and music or live video, in which rural users have higher mean scores.

Table 1 Background information of two field sites

Research Site	Fossil Village	Western Factory
Population	1025	8000
Major industry	Agriculture	Manufacturing
Basic unit	Production team	Department
Distance to county center	37.8 km	5.1 km

Table 2 Descriptive statistics of demographic variables in Fossil Village and Western Factory samples

Variable Name	Fossil Village (N ₁ = 128)			Western Factory (N ₂ = 229)			Test for Independence ^b	P-value
	n	Frequency	Percentage	n	Frequency	Percentage		
Age^a	122	Mean = 43.90 SD = 10.30 min = 18 max = 81		213	Mean = 36.57 SD = 8.17 min = 23 max = 59		Independent T-test t-statistics = 6.74, df = 208.44	<.001***
Gender	128			222			Chi-square Test $\chi^2 = 0.69$, df = 1	0.403
Male		63	49.22		99	44.59		
Female		65	50.78		123	55.41		
Marital Status	128			222			Chi-square Test $\chi^2 = 7.64$, df = 1	0.006**
Single		4	3.12		26	11.71		
Married		124	96.88		196	88.29		
Have Child	128			222			Chi-square Test $\chi^2 = 15.78$, df = 1	<.001***
No		3	2.34		36	16.22		
Yes		125	97.66		186	83.78		
Education	128			226			Chi-square Test $\chi^2 = 201$, df = 3	<.001***
Middle School (or below)		99	77.34		16	7.08		
High School		23	17.97		50	22.12		
Occupational School		4	3.12		103	45.58		
Undergraduate (or above)		2	1.56		57	25.22		
Monthly Disposable Income^a	127	Mean = 2434.02 SD = 1280.012 min = 291 max = 8333		205	Mean = 2274.39 SD = 964.92 min = 0 max = 5000		Independent T-test t-statistics = 1.21, df = 213.95	.228
Migrant Experience	128			221			Chi-square Test $\chi^2 = 6.92$, df = 1	.009**
No		99	77.34		141	63.80		
Yes		29	22.66		80	36.20		
Migrant Location	29			78			Fisher's Exact Test	<.001***
First tier cities (i.e. Beijing)		15	51.72		20	25.64		
Second tier cities (i.e. Xi'an)		1	3.45		31	39.74		
Third tier cities (i.e. Xiangyang)		4	13.79		22	28.21		
Counties (i.e. Happy Valley)		9	31.03		5	6.41		
Migrant Years^a	29	Mean = 4.55 SD = 4.24 min = 0.25 max = 17		77	Mean = 2.68 SD = 3.23 min = 0.1 max = 15		Independent T-test t-statistics = 2.15, df = 41.37	.037*

^a Age, Monthly Income, and Migrant Years are continuous variables, which are measured by years, Chinese Yuan, and years respectively.

^b Statistical tests show whether rural/urban residency and each demographic variable are independent or not. Fishers's Exact instead of Chi-square test will be used when expected values in any cell is less than 5.

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 3 Descriptive statistics of ICT adoption and experience variables in Fossil Village and Western Factory samples

Variable Name	Fossil Village (N ₁ = 128)			Western Factory (N ₂ = 229)			Test for Independence ^b	P-value
	n	Frequency	Percentage	n	Frequency	Percentage		
Has PC	128			224			Chi-square Test $\chi^2 = 100.46, df = 1$	<.001***
No		67	52.34		13	5.80		
Yes		61	47.66		211	94.20		
Has Mobile Phone	128			226			Fisher's Exact Test	.006**
No		5	3.91		0	0		
Yes		123	96.09		226	100		
Mobile-Only User	80			225			Chi-square Test $\chi^2 = 19.64, df = 1$	<.001***
No		18	22.50		115	51.11		
Yes		62	77.50		110	48.89		
Has Mobile Internet	123			226			Chi-square Test $\chi^2 = 85.36, df = 1$	<.001***
No		41	33.33		0	0		
Yes		82	66.67		226	100		
Has PC Internet	61			211			Fisher's Exact Test	.0384
No		3	4.92		5	2.37		
Yes		58	95.08		206	97.63		
Has Internet	128			227			Chi-square Test $\chi^2 = 64.52, df = 1$	<.001***
No		33	25.78		0	0		
Yes		95	74.22		227	100		
PC Years^a	57	Mean = 6.18 SD = 3.82 min = 1 max = 22		209	Mean = 8.42 SD = 3.68 min = 0.5 max = 20		Independent T-test t-statistics = -4.1, df = 86	<.001***
Mobile Years^a	119	Mean = 11.42 SD = 5.05 min = 2.0 max = 27		225	Mean = 11.67 SD = 4.31 min = 0.5 max = 25		Independent T-test t-statistics = -0.46, df = 210	.60
Time Spent Online^a	80	Mean = 2.23 SD = 1.81 min = 0.17 max = 8		217	Mean = 3.22 SD = 2.56 min = 0.17 max = 14		Independent T-test t-statistics = -3.7, df = 200	<.001***

^a PC Years, Mobile Years, and Time Spent Online are continuous variables, which are measured by years, Chinese Yuan, and years respectively.

^b Statistical tests show whether rural/urban residency and each demographic variable are independent or not. Fishers's Exact instead of Chi-square test will be used when expected values in any cell is less than 5.

* $p < .05$ ** $p < .01$ *** $p < .001$

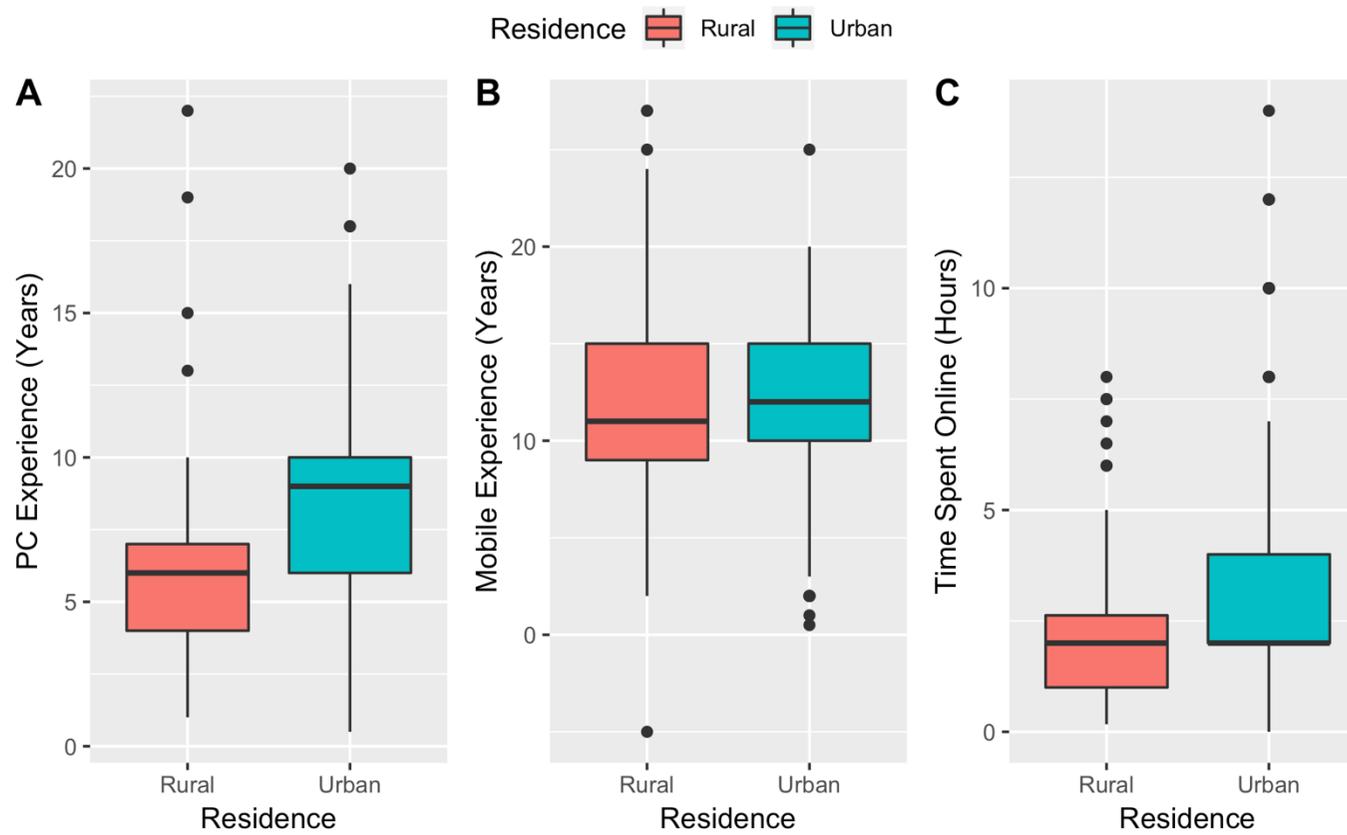


Figure 1 Bar plots of PC experience, mobile experience, and time spent online per day by rural and urban ICT users

Table 4 Descriptive statistics of engagement in various online activities in Fossil Village and Western Factory samples

Variable Name	Fossil Village (N ₁ = 128)			Western Factory (N ₂ = 229)			T-test statistics	df	P-value
	n	Mean	SD	n	Mean	SD			
Internet Activities: Document Processing	80	1.44	.793	217	3.14	1.174	-11.980	295	.000***
Internet Activities: Voice or Video Calls	80	3.29	.930	219	3.94	.730	-6.341	297	.000***
Internet Activities: SMS	80	3.73	1.018	219	4.16	.715	-4.125	297	.000***
Internet Activities: Emails	80	1.43	.854	215	2.92	.995	-11.917	293	.000***
Internet Activities: Games	80	1.80	1.084	208	2.32	1.110	-3.565	286	.000***
Internet Activities: Photos or Video	80	3.19	.781	217	3.31	.889	-1.117	295	.265
Internet Activities: Search Engine	80	2.66	1.222	212	3.56	1.067	-6.164	290	.000***
Internet Activities: Social Media	80	4.31	.880	218	4.19	.864	1.056	296	.292
Internet Activities: Music or Live Video	80	3.53	1.018	212	3.43	.871	.759	290	.448
Internet Activities: Navigation	80	2.03	1.147	216	2.89	.913	-6.724	294	.000***
Internet Activities: Finance	80	2.49	1.341	216	3.69	.825	-9.278	294	.000***
Internet Activities: Shopping	80	2.10	1.298	218	3.23	.928	-8.340	296	.000***
Internet Activities: Ecommerce	80	1.35	.969	215	2.21	1.245	-5.576	293	.000***
Internet Activities: Ebooks or MOOCs	80	2.11	1.212	219	2.76	1.036	-4.551	297	.000***
Internet Activities: Browsing News [Factory only] ^a	0	.	.	220	3.9636	.78720			

^a Online news browsing is only included in the urban survey

* $p < .05$

** $p < .01$

*** $p < .001$

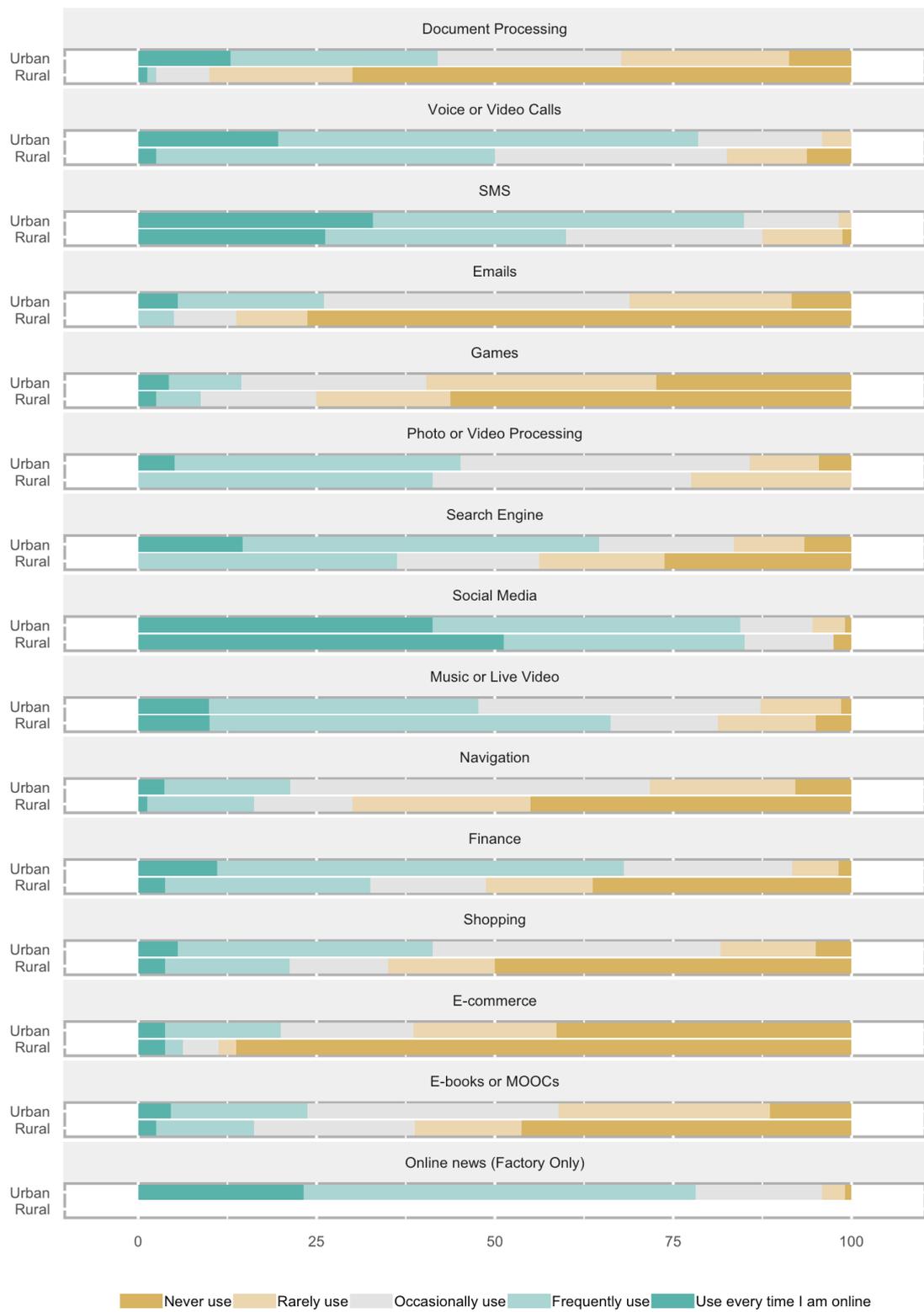


Figure 2 Comparison of online engagement in various Internet activities between rural and urban Internet use 4.2 Varieties of Internet development in rural and industrial China

4. Access divide: ICTs adoption, experience, and engagement

4.1 Demographic variances in ICT adoption

4.1.1 Adoption of the Internet and mobile-only user

A binomial logistic regression was conducted to examine the relationship between demographic variables on the likelihood of the adoption of the Internet, including PC Internet or mobile Internet. A backward stepwise model selection process was used to find the best fitting model based on the Akaike Information Criterion (AIC). Based on the final model (Table 5), age was found to be linearly related to the logit of the adoption of the Internet. The model that predicts the adoption of the Internet using age as explanatory variable, $\chi^2(1) = 24.23789$, $p < .001$, which explained 27.3% (Nagelkerke R^2) of the variance in Internet adoption. With the increase in age, the likelihood of adopting the Internet decreases.

Previous empirical studies have suggested the rising population of mobile-only users, who rely solely on mobile devices to access the Internet. we ran binomial logistic regression on the likelihood of becoming mobile-only users, with demographic variables as predictors. The backward stepwise model selection process shows the final model for being mobile-only user contains only one demographic variable, age, as the predictor. Table 6 shows that the model predicts whether the user is mobile-only with one's age, $\chi^2(1) = 16.88602$, $p < .001$. It explains 27.3% (Nagelkerke R^2) of the variance in being mobile-only. As age increases, the likelihood of being mobile-only user increases.

4.1.2 Experience of using PC and mobile phone

Experience of using ICTs is measured both by the number of years using mobile phone and the number of years using PC. To find out what demographic variables are associated with ICT experience, we ran two multiple linear regressions with ICT experience variables as outcome variables and demographic variables as predictors. We first used backward stepwise model selection processes, which starts with all predictors added in the model and removes

variables based on the AIC criteria. Two multiple linear regression models were then generated according to the model selection result. The summary of the model of experience of using mobile phone is shown in Table 7, and the summary of the model of experience of using PC is shown in Table 8.

Experience of using mobile phone is found to be associated with residence, age and whether the participant has migrant experiences in larger cities, $F(3, 320) = 9.255, p < .001$. The three demographic variables account for 7.12% of explained variability in mobile phone experience. Urban residents, older generation, and those who have worked as migrants in larger cities are more likely to have longer experience in using mobile phones, with other demographic variables held constant. Experience of using PC, on the other hand, is associated with age and education level. $F(4, 247) = 8.757, p < .001$. Two explaining variables account for 11% of explained variability in PC experience. Older generation and users who have education level at high school or above are more likely to use PC for longer years, with other demographic variables held constant.

4.1.3 Everyday online engagement

Everyday online engagement level is operationalised in the survey by the number of hours spent online. As shown in Table 9, everyday online engagement is associated with education level and age, $F(4, 279) = 9.595, p < .001$. Two explaining variables account for 10.83% of total explained variability in online enjoyment. Those who have attended occupational school or have education level above undergraduate spend longer hours online than those who have education below high school; older generation Internet users tend to spend shorter hours online than younger generation, holding another demographic variable constant.

Table 5 Logistic Regression Models for Internet Adoption

	B	SE	z value	p	Odds Ratio	95% CI for Odds Ratio	
						Lower	Upper
Step 1^a							
Constant	6.0780	1.9360	3.1390	0.0017**	436.0075	13.8583	29214.3100
Age	-0.1049	0.0352	-2.9780	0.0029**	0.9004	13.8583	29214.3100
Gender Female	0.6889	0.5117	1.3460	0.1782	1.9915	0.7297	5.5165
Education High School	-0.2875	0.7407	-0.3880	0.6979	0.7501	0.1810	3.5202
Education Occupational School	14.1900	1857	0.0080	0.9939	1.45E+06	7.50E-100	NA
Education Undergraduate (or above)	14.3100	2474	0.0060	0.9954	1.64E+06	1.00E-165	NA
Monthly Income	-0.0002	0.0002	-0.9450	0.3449	0.9998	0.9994	1.0002
Migrant Worker Yes	1.8940	1.1190	1.6920	0.0907 [^]	6.6427	1.0419	130.9907
Step 2^b							
Constant	7.48442	1.67757	4.461	0.00001***	1780.088284	93.6890457	69998.650
Age	-0.13407	0.03411	-3.93	0.00008***	0.8745259	0.8121157	0.929

^a Note. R²= .226 (Hosmer–Lemeshow), .217 (Cox–Snell), .328 (Nagelkerke). Model $\chi^2(7) = 29.54616, p < .001$.

^b Note. R²= .184 (Hosmer–Lemeshow), .18 (Cox–Snell), .273 (Nagelkerke). Model $\chi^2(1) = 24.23789, p < .001$.

*** $p < .001$; ** $p < .01$; * $p < .05$; [^] $p < 0.1$

Table 6 Logistic Regression Models for Mobile-only User

	B	SE	z value	p	Odds Ratio	95% CI for Odds Ratio	
						Lower	Upper
Step 1^a							
Constant	-1.8090	2.5090	-0.7210	0.4710	0.1639	0.0009	20.6126
Age	0.0841	0.0486	1.7310	0.0835 [^]	1.0877	0.9921	1.2049
Gender Female	0.7305	0.7900	0.9250	0.3551	2.0762	0.4455	10.4977
Education High School	-1.1450	0.7844	-1.4600	0.1444	0.3182	0.0679	1.5482
Education Occupational School	-18.5300	1927	-0.0100	0.9923	9.00E-09	NA	1.70E+86
Education Undergraduate (or above)	-18.5800	2797	-0.0070	0.9947	8.55E-09	NA	2.66E+181
Monthly Income	0.0001	0.0003	0.3130	0.7544	1.0001	0.9995	1.0007
Migrant Worker Yes	-0.3208	0.8349	-0.3840	0.7008	0.7256	0.1403	3.9527
Step 2^b							
Constant	-3.9919	1.4002	-2.8510	0.0044**	0.0185	0.0010	0.2512
Age	0.1373	0.0380	3.6140	0.0003***	1.1471	1.0704	1.2444

^a Note. R²= .374 (Hosmer–Lemeshow), .333 (Cox–Snell), .503 (Nagelkerke). Model $\chi^2(7) = 31.53022, p < .001$.

^b Note. R²= .184 (Hosmer–Lemeshow), .18 (Cox–Snell), .273 (Nagelkerke). Model $\chi^2(1) = 16.88602, p < .001$.

*** $p < .001$; ** $p < .01$; * $p < .05$; [^] $p < 0.1$

Table 7 Multiple Regression Models for Mobile Experience,

	ΔR^2	B	SE B	β	p
Step 1					
(Constant)	0.06730	6.09957	1.78562		0.000725***
Residence Urban		1.04233	0.85010	0.11096	0.221130
Age		0.10835	0.03522	0.22294	0.002293**
Gender Female		-0.71322	0.53530	-0.07849	0.183761
Education High School		0.48202	0.88486	0.11769	0.586346
Education Occupational School		0.12318	1.06281	28.31745	0.907807
Education Undergraduate (or above)		-0.55700	1.18948	-0.05718	0.639935
Monthly Income		0.00022	0.00025	0.00002	0.374996
Migrant Worker Yes		1.84714	0.59161	3.80070	0.001973**
Step 2					
(Constant)	0.07121	5.33727	1.37520		0.000126***
Residence Urban		0.98324	0.54694	0.10369	0.073167 [^]
Age		0.13039	0.02904	0.26811	0.00000993***

Migrant Worker Yes	2.05026	0.54342	0.21083	0.000192***
--------------------	---------	---------	---------	-------------

*** $p < .001$; ** $p < .01$; * $p < 0.05$; $\wedge p < 0.1$

Table 8 Multiple Regression Models for PC Experience,

	ΔR^2	B	$SE B$	β	p
Step 1	0.11110				
(Constant)		0.38660	1.82500		0.832400
Residence Urban		1.05500	0.82560	0.11744	0.202500
Age		0.11030	0.03773	0.25140	0.00382**
Gender Female		0.76320	0.50000	0.09920	0.128300
Education High School		2.12100	0.89380	0.57842	0.01847*
Education Occupational School		3.36900	1.03600	#####	0.00133**
Education Undergraduate (or above)		2.67200	1.17200	0.33533	0.02356*
Monthly Income		-0.00005	0.00025	-0.00001	0.840420
Migrant Worker Yes		0.45210	0.53720	1.03079	0.400860
Step 2	0.11000				
(Constant)		1.67327	1.55602		0.283266
Education High School		2.62571	0.70952	0.71027	0.000265***
Education Occupational School		4.18621	0.71027	9.60456	0.000000123***
Education Undergraduate (or above)		3.25278	0.85366	0.87989	0.000175***
Age		0.09624	0.03232	0.22081	0.003191**

*** $p < .001$; ** $p < .01$; * $p < 0.05$; $\wedge p < 0.1$

Table 9 Multiple Regression Models for Time Spent Online

	ΔR^2	<i>B</i>	<i>SE B</i>	β	<i>p</i>
Step 1	0.10480				
(Constant)		4.04340	0.96202		0.0000364***
Residence Urban		0.25953	0.44949	0.05133	0.564190
Age		0.05731	0.02016	-0.21271	0.00483**
Gender Female		-0.17958	0.28686	-0.03892	0.531850
Education High School		0.28365	0.48039	0.13313	0.555410
Education Occupational School		0.47428	0.55448	216.15610	0.393150
Education Undergraduate (or above)		0.92004	0.62828	0.19195	0.144310
Monthly Income		0.00017	0.00013	0.00003	0.200800
Migrant Worker Yes		0.36381	0.30341	1.35042	0.231600
Step 2	0.10830				
(Constant)		4.54057	0.82749		0.0000000917***
Education High School		0.38899	0.39458	0.17753	0.325060
Education Occupational School		0.82509	0.37911	3.02631	0.03036*
Education Undergraduate (or above)		0.03036	0.44862	0.53387	0.00961**
Age		-0.05916	0.01799	0.21697	0.00113**

*** $p < .001$; ** $p < .01$; * $p < 0.05$; $\wedge p < 0.1$

4.2 Understanding the social mechanisms behind the access divide

Previous sessions have shown despite the wide penetration and increasing uptake of ICTs in Middle China, there are still digital divide in adoption of the Internet, ICT experiences, and everyday online engagement among different demographic groups. Meanwhile, some demographic variables such as income level and gender, which were documented as important factors for ICT adoption and use in previous fieldwork in China (Wallis, 2013), were not found to be associated with ICT adoption in this project. Data analysis on qualitative interviews and focus group studies reveal the mechanisms behind ICT adoptions in rural and urban China, showing how demographic variables such as age, urban residence or migrant experience, and education, influence grassroots technology development.

4.2.1 Generational gap in ICT adoption

The main barriers that constrain elderly people to access the Internet is the lack of familiarity with *pinyin*, one of the most popular ways of spelling Chinese character using the alphabet on PC or mobile phone keyboard. Shun, aged 63, is a well respected village leader. He only recently started using WeChat on his Huawei smart phone early 2016. He complained about the difficulties of using the Internet due to his poor spelling skills:

“People around my age are undereducated in rural areas. I didn’t have the chance to attend school and learned to read by myself. I could only handwrite very few characters (*shouxie*) on my mobile phone. I know *pinyin* is more efficient, but I don’t even know how to pronounce proper mandarin, let alone spelling it on my phone... That’s why I don’t use the Internet that much, because of my poor spelling and typing skills.”

Yue, aged 48, has only attended primary school in Fossil Village. She started using the Internet to avoid “becoming the lagging behind ‘antique’, who couldn’t have interesting conversations with the young generations in the village”. Like Shun, Shen also finds *pinyin* extremely difficult. She also tried voice input but was often misunderstood by her smart phone

due to her Henan accent. Nevertheless, Shen told me that the increasingly diversified information format available on the Internet has helped the older generation in rural China to access online information despite their lack of literacy.

“I am a slow reader, but I am good at memorizing images and videos. I use music or video apps instead of news apps that are full of texts. Applications nowadays are more user-friendly than few years ago: They replaced text titles with pictures of singers or dancers, which is so convenient for people like me, who find typing and searching challenging.”

By memorising profile pictures of her favourite dancing tutorial video, Yue learned group dancing on her mobile phone. However, her online engagement is still constrained by the lack of knowledge in *pinyin* input. She feels stressful when “opening an app that seems informative” and “seeing the sheer amount of new information in text format”. But she finds out that by using the recommendation system within the applications, which automatically tailors content based on her previous viewing history, she felt *pinyin* is less essential as an Internet skill.

Although Internet adoption in rural China is lower among the older generation. After conducting interviews with those who do not have direct access to mobile or PC Internet, we would not name this group of rural residents as “non-users” of the Internet. Part of the reason why elderly users do not start using the Internet is due to their access to Internet proxies, relatives, friends and neighbours to help them find information, make online purchases, and even download videos on the Internet. 62-year-old Qiang is the father of the most accomplished businessmen in Fossil Village. Qiang helped his son at the local shop. When asked about his barriers of accessing the Internet, he replied, “I tried to learn typing *pinyin* for a while and failed. Now I suddenly feel that since there are so many young people around me, I don’t have to learn.” Qiang showed me a QR code printed on a A4 paper, which he used for accepting

online payment by the customers, “This is my neighbour’s WeChat wallet. She helps me to manage this money transfer tasks on the Internet.” Qiang’s grandson helped him to search for news reports and order products online. Yue also had her Internet proxy when she was new to the Internet, Yue’s son, who worked in Happy Valley County, would send her links of online music videos on WeChat, introducing her to online resources beyond social media content. To sum up, older generation in rural China face challenges in using keyboard to spell characters, which often hinder the adoption of the Internet and limit their online engagement. Recent technology development in voice recognition, recommendation system, and diversified information resources have helped elderly users to overcome the language barrier to ICT adoption. Internet and information proxies, including neighbours and children, play important roles in indirectly connecting the older generation in rural China to the Internet.

4.2.2 ICT diffusions from urban to rural China

The diffusion of ICTs from urban to rural Middle China is described by many middle-aged interviewees as a digital wave from the cities. For example, Fang, who is often the centre of the social circle in Fossil Village and a keen organiser of poker games, was introduced to the Internet three years ago by her daughter, who worked in Zhengzhou, the capital city of Henan Province. She explained:

“We (rural residents) are generally lack in education compared to urban residents. It took us longer time to adapt with new technologies. More importantly, we live in a community that is exclusive and don’t have the chance to exchange information, knowledge, and technologies with other people. My daughter works in Zhengzhou. She meets more people and hears about more new information in a day than I could achieve in a year.”

Young people who have worked in larger cities are often the proxies for new users of the Internet in rural China. Jing and her husband studied and worked in cities in the

neighbouring province. Her husband did computer science in the occupational school. She vividly remembered how she skipped classes to go to an Internet bar with her classmates, “my classmates from urban areas have been using QQ for more than four years but I was the only Internet dummy in the cohort.” And now, going back from the urban area and running family business in Fossil Village, she feels “her whole life is spent online”. In fact, she and her husband helped villagers to buy new phones from online retailers, and also helped fix mobile phones or PCs in their spare time:

“My relatives and neighbours in Fossil Village needs information more than technical assistance from me. For example, they often ask me for recommendations on skincare brands. I know for a fact that they don’t really want to know about *my* opinion; they want me to look online for opinions of urban customers, who are more experienced than me. I know my opinions is not persuasive or useful for my friends. So, I search on Baidu or Taobao, showing them comments from other customers. When it comes to online experience, I think we (rural customers) are still too naïve.”

Jing’s observation on the rural-urban experience gap is supported by Shun, who frequently travel for work between the village and town centre and have witnessed the ICT development in both rural and urban areas in Happy Valley County:

“There were many Internet functions that were not accessible in Fossil Village. If you live in Happy Valley County, ordering a bowl of dumplings on mobile phone takes a click and cash, of course. But here in rural areas, who would be stupid enough to take your order and deliver the food? It’s just so remote from everything.”

Shun thinks the lack of Internet experience among rural residents is in fact partly due to the lack of accessible Internet service available. Nevertheless, Changhua, a young housewife who saw her family agritourism grows thanks to the Internet is optimistic about ICT development in rural China,

“We have customers who come live with us in Fossil Village just because of the so-called ‘health benefits’ of living a rural life. I see a wave of the opposite direction, from rural to urban, advocating rural lifestyle and rural diet.”

Changhua’s experience reflected an increasing representation of Chinese rural population and rural everyday life on the Internet, which gradually introduce another wave of content generation and information diffusion from rural to urban China. This phenomenon has taken place on Chinese Internet simultaneously with the urban-to-rural technology diffusion, and both trends suggest the accelerating exchange of technology and information between Chinese rural and urban societies.

4.2.3 PC adoption through formal education

Education level is found in survey data analysis to be significantly associated with experience of using PC and online engagement, with other demographic variables held constant. Interviews with participants who have different education level suggest that Chinese formal education system play a crucial role in ICT adoption.

Yanbo, an 18-year-old high school graduate, told me how she adopted PC from IT classes in high school. She attended middle school in Happy Valley County centre, where IT classes are compulsory for all students. Before learning to use PC, Yanbo’s mobile Internet activities mainly consist of chatting with friends on QQ or watching reality shows on iQiyi, an online video platform:

“The school introduces us to PC Internet, teaching basic skills such as using search engine, and managing documents in Microsoft Office. There are some tasks that I find PC more efficient than mobile phone. For example, when working on my English writing, search engine on PC displays files in a more readable way. Although I don’t have PC at home, I use PC at my classmate’s house in the county centre and sometimes download TV drama and software for my mom.”

Interviewees aged under 30 years old have learned PC skills mostly through formal education. Experience of using PC was not considered as essential for ICT skills by the interviewees at first, but this group of ICT users often find themselves becoming Internet proxies for mobile-only users. Interviews with workers in Western factory shows that PC skills are often required for management positions. Lili, manager of one of the storages in the factory learned to use computers in the occupational school:

“I learned PC Internet in 1998 at school. I was one of the few workers in the factory who knows how to open and save files on computers at that time. So when there was a position requires the use of PC and email to send and receive images of products in the 2000s. My school trainings on IT skills were proved to be useful.”

Although the multi-functional mobile phone could satisfy most of everyday information, communication and entertainment needs, adoption and use of PC is still beneficial for individuals to live and work in the digital era. People who are not frequent users of PC but know basic knowledge of computers are still advantageous in exploiting various Internet functions to solve problems and fulfil information needs. PC adoptions through formal education is considered by many interviewers to be an efficient approach of acquiring digital skills.

5. Use divide: everyday Internet activities

5.1 Demographic variances in everyday Internet use

Participation in various Internet activities are measured by 14 Likert-scale questions³ in the survey. We conducted a Principal Components Analysis (PCA) on these 14 items with varimax rotation, which maximise the dispersion of loadings within each factor. The Kaiser-Meyer-Olkin test suggests the sampling size is adequate (KMO = .87, KMO values for each item are all above .80). Bartlett's test suggest items were correlated for PCA ($\chi^2(91) = 1415.899, p < .001$). Initial analysis shows there are three components have eigenvalues greater than 1, and therefore I extracted three components using the Kaiser's criterion. The four components explain 58.13% of the variance. Scree plot (See Figure 3) also suggests that there should be three components in the PCA. In the second PCA analysis, three components remained in the factor loadings. Table 10 shows the summary of PCA results after rotation for the 14 items related to participation in Internet activities. It seems that component 1 consists of Internet activities related to Culture and Online Consumption, component 2 includes Internet activities related to Professional and Economic Practices, and component 3 is related to Social Networking and Communication. Components scores, which are the linear composite of original variables were saved as new variables for further analysis. The PCA shows three underlying components in Internet activities and help classify various Internet activities into three types: 1) entertainment and online consumption, 2) professional and economic practices, and 3) social networking and communication (See Table 10).

³ In the urban sample, an extra question was added to measure participation in online news reading

Table 10 Summary of exploratory factor analysis results for participations in Internet activities

Items	Factor loadings (varimax rotated) ^a		
	Culture and Online Consumption	Professional and Economic Practices	Social Networking and Communication
Online shopping	.664	.498	.177
Navigation	.649	.403	.104
E-commerce	.645	.316	-.073
Photos or videos	.601	-.044	.379
Games	.559	.110	.032
Music or live video	.532	-.196	.446
E-books or MOOCs	.495	.356	.119
Processing documents	.118	.839	.088
Emails	.233	.824	.111
Money transfer	.527	.556	.273
Search engine	.398	.496	.346
Social media	.162	-.024	.818
SMS	.043	.280	.756
Voice or video calls	.067	.383	.640

^a Factor loading are sorted by size

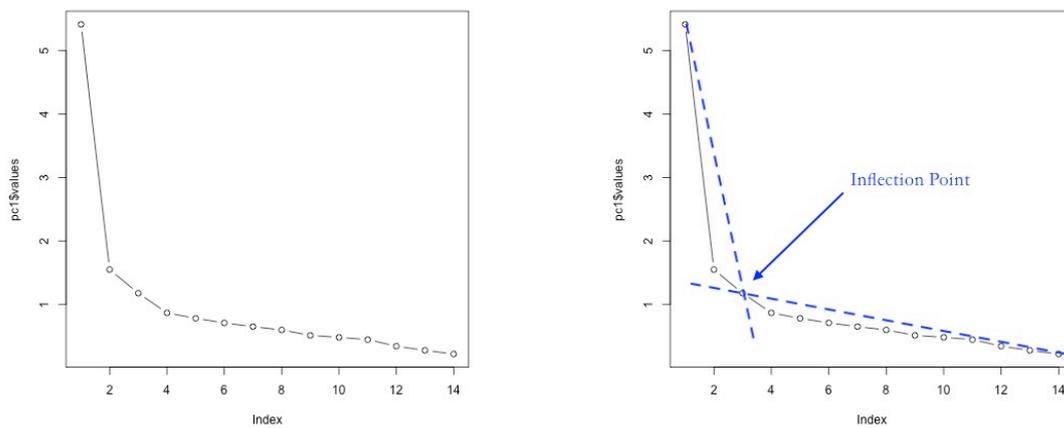


Figure 3 Scree Plot from the Principal Components Analysis of Internet Activities Items. Plot on the right shows the inflection point at the 3rd component.

5.1.1 Culture and Online Consumption

We ran multiple regression analysis on the three component of Internet activities with demographic variables as predictors. Backward stepwise method was employed to find the model that best improved the AIC score. Results from the multiple regression models were shown in Table 11. In the model of the first component, culture and online consumption, three variables were found to be associated with this type of Internet activities: age, gender and education, which accounts for 14.15% of variances in online participation in culture and online consumption. Older generation and female Internet users are found less likely to participate in cultural activities or consume online than other users. Users who have attended high school are more likely to participate in this type of Internet activities than those who only attend primary and middle school.

5.1.2 Professional and Economic Practices

The final multiple regression model for the second type of online activities, professional and economic practices shows that urban residence, education above high school level, and having migrant experience are associated with more active participation in Internet activities such as processing documents, sending emails, money transfer and using search engine. People with higher income level are also more likely to participate in this type of Internet activities. The model accounts for 60.14% of total variances in the dependent variable.

5.1.3 Social Networking and Communication

The model for online participation in social networking and communication suggests that two demographic variables, gender and monthly income, are associated with the use of social media and SMS. The model accounts for 3.54% of total variances in the component. Older generation and users who have lower monthly income are less likely to participate in social networking and communication activities online.

Table 11 Multiple Regression Models for Three Types of Internet Activities

	Culture and Online Consumption					Professional and Economic Practices					Social Networking and Communication				
	ΔR^2	<i>B</i>	<i>SE B</i>	β	<i>p</i>	ΔR^2	<i>B</i>	<i>SE B</i>	β	<i>p</i>	ΔR^2	<i>B</i>	<i>SE B</i>	β	<i>p</i>
Step 1															
(Constant)		1.40500	0.41410		0.00082		-1.79300	0.29870		0.00000		0.15116	0.45976		0.74260
Residence Urban		-0.02935	0.19700	-0.01424	0.88170		0.73490	0.14210	0.33877	0.00000		-0.11002	0.21870	-0.05207	0.61540
Age		-0.03884	0.00856	-0.34297	0.00001		0.00705	0.00618	0.05912	0.25516		-0.01532	0.00951	-0.13191	0.10860
Gender Female		-0.03884	0.00856	-0.14690	0.00001		-0.03006	0.08895	-0.01475	0.73573		0.13144	0.13689	0.06623	0.33800
Education High School	0.16580	0.58290	0.21050	0.65983	0.00609	0.60820	0.55960	0.15190	0.60174	0.00029	0.02163	0.01183	0.23376	0.01306	0.95970
Education Occupational School		0.20690	0.24680	2.22E+02	0.40255		1.06400	0.17800	1.09E+03	0.00000		0.11030	0.27399	1.16E+02	0.68770
Education Undergraduate (or above)		0.16600	0.27730	0.08324	0.54984		1.35000	0.20000	0.64282	0.00000		-0.06442	0.30784	-0.03150	0.83440
Monthly Income		-0.00003	0.00006	-0.00001	0.63901		0.00009	0.00004	0.00004	0.03665		0.00016	0.00006	0.00008	0.01030*
Migrant Worker Yes		0.12040	0.12880	1.06284	0.35100		0.17710	0.09292	1.48512	0.05797		0.10601	0.14301	0.91304	0.45930
Step 2															
(Constant)		1.30218	0.37818		0.00068***		-1.48900	0.12750		< 2e-16***		0.23830	0.30820		0.44014
Residence Urban							0.85050	0.13500	0.39256	0.00000***					
Age		-0.03691	0.00797	-0.32004	0.00001***							-0.01593	0.00740	-0.13765	0.03225*
Gender Female		-0.31415	0.11687	-0.15924	0.00767**										
Education High School	0.14150 ^a	0.54525	0.17196	0.59667	0.00171**	0.6014 ^b	0.43890	0.14350	0.47408	0.00247**	0.03540 ^c				
Education Occupational School		0.22566	0.16581	1.95655	0.17476		0.87470	0.15870	9.02E+02	0.00000***					
Education Undergraduate (or above)		0.17282	0.19659	0.08760	0.38022		1.13400	0.16860	0.54459	0.00000***					
Monthly Income							0.00009	0.00004	0.00004	0.03240*		0.00016	0.00006	0.16910	0.00869**
Migrant Worker Yes							0.18420	0.08570	0.19897	0.03261*					

*** $p < .001$; ** $p < .01$; * $p < .05$; $\wedge p < 0.1$

^a $F(5, 248) = 9.342, p < .001$

^b $F(6, 238) = 62.36, p < .001$

^c $F(2, 236) = 5.367, p = .005255$

5.2 After access: exploring the mechanisms behind the use divide

5.2.1 Culture and online consumption

Female interviewees experienced a lack of Internet participation, particularly in online entertainment and consumption of cultural products on the Internet. Fang from Fossil Village explained to me why she thinks women in rural China should avoid “reading too much online”. She relies heavily on WeChat as a source of cultural and entertainment resources, because content “sent from friends” is often more relevant to the rural life:

“I could stay happy if I don’t choose to see how other people live a wealthy life. The online world is often an urban world. For me, I have never worked in the cities, and couldn’t possibly fulfil my desire of being a super-rich.”

Changhua was visiting Fang during the interview, she added: “Rural women are ‘superficial’ for a reason: We don’t work and hence have fewer pocket money for shopping; We watch romantic dramas but are stuck with our marriage in reality. I would tell all of my girlfriends: don’t overthink.” Female Internet users in urban area are also withdrawing from consuming cultural products from the Internet. Lili experienced the gender gap in Internet participation from her own experience:

“I accept the fact that Henan is a conservative province, and my generation has been constrained in our role as housewives. However, I am deeply concerned for my daughter, for she lives in a digital world that emphasises ‘women with high education are unmarriageable’. The more I read online, the more I feel anxious and disoriented. I try to find values from online content that support my belief, but on the contrary, I find a value crisis for Chinese female, especially for my daughter’s generation.”

Female interviewees who have received higher education show similar level of participation in culture, entertainment, and online consumption as male interviewees. Mimi is one of the few persons in Western factory to run micro-entrepreneurship online as a part-time

career. She works as a sale representative of a Swedish cosmetics company on weekends and holidays. Through her narrative of her experience in running online business, we saw her great passion for e-commerce. Married at the age of 22, she used to be treated as a typical Chinese housewife by her husband and mother-in-law. Her life changed when she joined the business team with her schoolmates as sale representatives:

“I find customers on WeChat and extend my business network through WeChat groups. After working both full-time in the factory and part-time on the Internet, my monthly income doubled. I no longer need to beg my husband to take more family responsibilities, because my status within the family improves as I contribute more substantially to the family’s finance.”

Unlike Lili, Mimi does not feel the lack of valuable content for women to consume on the Internet. “The Internet provide massive amount of cultural and entertainment products for everyone. But I think the most important factor is for us (female users) to have incentive to learn.” Her incentive to learn, originate from the “continuing motivation to establish a profession like my college friends.”

5.2.2 Professional and economic practices

Frequent use of search engine often relates to professional context, for example, searching for government policy on Chinese medicine by an office clerk in Western factory, or searching for pictures of house construction plans by a construction worker living in Fossil village.

Yue, a non-user of search engine in Fossil Village told me that she “only receives information” by news app and WeChat notifications, both were installed on the phone either by the mobile phone manufacture or by her son. “I know there is an app called Baidu, which delivers things upon your request. However, I rarely use search engine because I don’t know how to describe my needs.” With limited experience in using search engines, Yue “meets” the

topics she is interested in by chance instead of actively “seeks” online information. Fang, who is also a non-user of search engine, has a different reason of not using the Internet for professional and economic practices. Comparing to search engine, she prefers “using people around me as my ‘Baidu’”, which she considers to be more “locally-relevant” and also “trustworthy”. Young generations in Fossil Village, most of whom have worked or lived in urban area hold different views toward search engine than their parents. Yingying, who studied in Happy Valley County and returned to Fossil Village, enjoyed the role of search engine in introducing her to new skills:

“Search engine is the first place I would go to for new information and skills. I don’t want to fall in the stereotype of a rural girl and teach myself to learn playing music instrument like electronic keyboard. I find tutorials from Baidu and learn musical notations from images.”

Among Internet users who participate in professional and economic activities online, I observed the influence of education on different sophistications in use. Xia works at the management role in IT department in Western factory, although she graduated from university more than 10 years ago, education background in computer science has clearly helped her mastering search engine in both professional setting and everyday context.

“The best search engine in my opinion is Google, before it has been banned by the government. I define a good search engine as one that clearly distinguish sponsored ads and search results, which domestic search engine like Baidu fails to incorporate the design.”

Ling works in one of the manufacturing departments in the factory. She feels her use of the Internet “is limited”, due to the lack of “diversity in information sources”. Ling has not tried any of the search engines other than Baidu, because she considers “familiarity with functionalities on the search engine is more important than search efficiency.” Another usage

difference between Ling and Xia is their use of advanced search methods. Xia use voice search on Baidu app on her mobile phone in everyday life, because “voice to text transformation is more efficient than typing and shows similar search results.” Ling, on the other hand, only uses text search, and finds it difficult sometimes to switch between text and voice input.

5.2.3 Social networking and communication

Social connection (*guanxi*) culture is considered by social science researchers as an important characteristic of Chinese society (Kipnis, 1996; Gold, Guthrie, and Wank, 2002). The functional use of *guanxi* through online social networking apps is reflected in the differentiated participations in such Internet activities by interviewees who have higher social-economic status. Wei is the manager of a manufacturing department at Western factory and also a heavy user of WeChat. Among dozens of WeChat groups that he added in the app, a group that he finds most useful is formed by local friends who share the same interests and have similar experience in investing in stock market. Wei considers the group to be a “library of human resources (*renmai*)”:

“People who knows stock market are often wealthier than the rest of my friends. I rely on this group to introduce me to weaker ties. For example, if I need inside information about policies in a telecommunication company, I would turn to this group, asking for reference to employees who work in the company to solve my problem. Comparing to traditional social networks, this group network could not directly help with my career but is an important resource for solving minor problems in life.”

Active use of social networking apps might sometimes result in an increase in income level. Gui is one of the few employees in Western factory who successfully find a new career from the digital economy. He now worked both as a Didi⁴ driver and a sale representative for

⁴ Didi is a major Chinese ride-sharing company.

a local alcohol manufacturer. He found business opportunities through a WeChat group, which consists of hundreds of volunteers in a local charitable organisation. He described that the opportunity “found” him because his business partner appreciated his active role in managing and organising the online group. And through participation in online social networking, he “changed his old-fashioned perception of depending on a ‘stable’ salary and encouraged him to not only socialise online, but build a career based on his online network.”

Age, however, in many cases hinder older generation Internet users to explore new functions and establish new connections on social networking platforms. Shun, previous head of the Fossil Village, has a WeChat account but could only accept friends’ invitations because of his unfamiliarity of using mobile phone. He also dislikes group chat functions on WeChat, because it “violated the basic rule of social networking in China”, which states “birds of a feather flock together (*wuyileiju*)”. Retired from his job as the head of the village, Shun also use his WeChat network to sale life insurance to friends. But different from Gui, he distrusts online friends whom he never meets through offline social networks. “money and friends, these are the two things that I only made offline,” Shun restated his opposition to virtual network.

6. Conclusion and discussion

In the project we used survey data collected from Fossil Village and Western Factory in Middle China in 2017 and 2018 to describe ICT development in rural and urban China. Summary statistics from descriptive data analysis suggests an unequal ICT adoption of the Internet, mobile phone and PC between rural and urban China, and points out rural-urban difference in experience of using digital technologies and everyday online engagement level. Rural and urban Internet users also show different level of participations in various Internet activities. Observing the digital divide in adoption, experience, engagement and use of ICTs in rural and urban China, we ran statistical tests to study the influence of demographic variables including residence, age, gender, education, income, and migrant experience in different stage of ICT domestications. Two types of divide, access and use, are defined with the former consists of gaps in ICTs adoption, experience, and engagement and the latter concerns with gaps in Internet use. Table 11 shows a summary table of different levels of digital divide and their relationships with demographic variables.

Quantitative results show that age is associated with all variables in the access divide: the older generations are more likely to become Internet non-users or mobile-only Internet users. They tend to have longer mobile and PC experience but are less engaged online every day, measured by the hour they spent online. Longer experience of using mobile phone is found positively related to having migrant experience or living in urban area. Experienced use of PC and everyday online engagement, however, is associated with higher education level.

Using qualitative data, we examined the social mechanisms behind the ICT access divide. Lack of knowledge of *pinyin* is a barrier to the adoption of ICT for older generations, but new information formats such as video and audio, and proxy users, including family members or neighbours, have started to bring the undereducated elderly users online. Interviews with rural Internet users who have migrant experience suggest the urban-to-rural

ICT diffusion happens both at the technical level (introducing villagers to new functionalities) and at informational and lifestyle level (presenting urban way of life). Despite an increase in cultural representation of rural society on Chinese Internet, rural-urban difference in infrastructure and structure of economic industries still inhibit rural Internet users to fully benefit from the digital economy. Chinese institutional education on ICT skills show positive impact on equipping both rural and urban population with PC skills, indicating the mutual process of top-down and bottom-up informatisation process in ICT adoption.

Before conducting statistical analysis on demographic factors behind the ICT use divide, we first categorised various Internet activities into three components using Principal Component Analysis (PCA) and reduce the dimension for analysis into Internet activities related to 1) Culture and Online Consumption; 2) Professional and Economic Practices; and 3) Social Networking and Communication. It is important to note that use of search engine is classified as a sub-category of professional and economic practices, which locates in the same category with managing documents, money transfer, and sending emails. Regression models show that age, being female users, and having education level below high school degree are negatively associated with the use of Internet for culture, entertainment and consumption. Residence in urban area, having migrant experience, having higher education and income level are found to be related to more frequent use of the Internet in professional and economic practices. Older generation and users with lower income level are less likely to use the Internet for social networking and communication.

Qualitative interviews show the demographic variances in Internet use after access of ICTs. Experience both a lack of equal representation online and a gender discrimination mirroring offline social dynamic, some female users show a withdrawal of Internet use for entertainment and cultural consumption. And yet, young female interviewees who received higher education find new opportunities for micro-entrepreneurship through the use of the

Internet and received improvement of social status. we also explored how rural users lack the use of search engines due to unfamiliarity with information searching and distrust of online information sources. Sophistications in using search engine also seems to vary among users of different education levels, with the more educated users have diversified search engine platform and advanced search methods. Functional use of the Internet for social networking and communication still requires accumulation of offline social capital, or *guanxi*, but active participation in online social network could also lead to new offline social connections and even job opportunities.

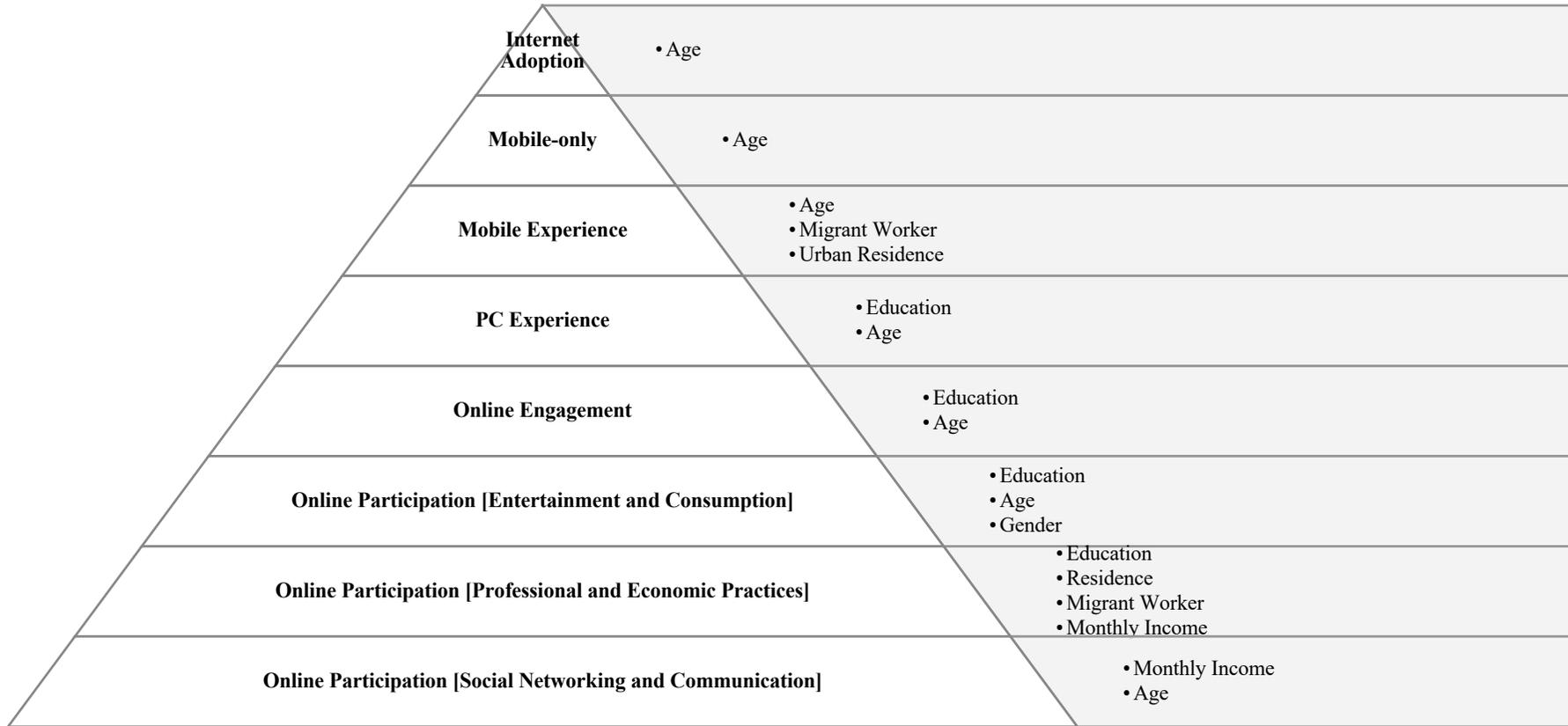


Figure 4 Summary table of demographic variables associated in different levels of digital divide

References

- Bond, R. M., Fariss, C. J., Jones, J. J., Kramer, A. D. I., Marlow, C., Settle, J. E., & Fowler, J. H. (2012). A 61-million-person experiment in social influence and political mobilization. *Nature*, 489(7415), 295–298.
- Cothey, V. (2002). A longitudinal study of World Wide Web users' information-searching behavior. *Journal of the American Society for Information Science and Technology*, 53(2), 67–78.
- Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks: SAGE Publications, Inc.
- Creswell, J. W. (2015). Mapping the Developing Landscape of Mixed Methods Research. In A. Tashakkori & C. Teddlie (Eds.), *SAGE Handbook of Mixed Methods in Social & Behavioral Research* (pp. 45–68). Thousand Oaks: SAGE Publications,
- DiMaggio, P., & Hargittai, E. (2001). From the ‘digital divide’ to ‘digital inequality’: Studying Internet use as penetration increases. Princeton: Center for Arts and Cultural Policy Studies, Woodrow Wilson School, Princeton University, 4(1), 4-2.
- Donner, J. (2015). *After access: inclusion, development, and a more mobile internet*. Cambridge, Massachusetts: The MIT Press.
- Donner, J., Gitau, S., & Marsden, G. (2011). Exploring mobile-only Internet use: Results of a training study in urban South Africa. *International Journal of Communication*, 5, 574–597.
- Ellery, P. J., Vaughn, W., Ellery, J., Bott, J., Ritchey, K., & Byers, L. (2013). Understanding internet health search patterns: An early exploration into the usefulness of Google Trends. *Journal of Communication in Healthcare*, 1(4), 441–456.
- Gao, Q., Abel, F., Houben, G.J., & Yu, Y. (2012). A Comparative Study of Users’ Microblogging Behavior on Sina Weibo and Twitter. In *User Modeling, Adaptation,*

- and Personalization (Vol. 7379, pp. 88–101). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Gold, T., & Guthrie, D. (2002). *Social Connections in China*. (T. Gold, D. Guthrie, & D. Wank, Eds.). Cambridge: Cambridge University Press.
- Goldfarb, A., & Prince, J. (2008). Internet adoption and usage patterns are different: Implications for the digital divide. *Information Economics and Policy*, 20(1), 2-15.
- Hanna, N. K., Qiang, C. Z. W., Bhavnani, A., Kimura, K., & Sudan, R. (2009). *Rural informatization in China*. The World Bank.
- Hargittai, E., & Walejko, G. (2008). The participation divide: Content creation and sharing in the digital age. *Information, Community and Society*, 11(2), 239-256.
- Hine, C. (2015). *Ethnography for the internet embedded, embodied and everyday*. London: Bloomsbury Academic
- Kipnis, A. B. (n.d.). The language of gifts: Managing guanxi in a North China village. *Modern China*, 22(3), 285–314.
- Lazer, D., Kennedy, R., King, G., & Vespignani, A. (2014). The Parable of Google Flu: Traps in Big Data Analysis. *Science*, 343(6176), 1203–1205.
- Hanna, N. K., Qiang, C. Z. W., Bhavnani, A., Kimura, K., & Sudan, R. (2009). *Rural informatization in China*. The World Bank.
- Ruths, D., & Pfeffer, J. (2014). Social media for large studies of behavior. *Science*. 346(6213), 1063-1064.
- Shaw, A., & Hargittai, E. (2018). The Pipeline of Online Participation Inequalities: The Case of Wikipedia Editing. *Journal of Communication*, 68(1), 143-168.
- Van Dijk, J., & Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. *The information society*, 19(4), 315-326.
- Wallis, C. (2013). *Technomobility in China*. New York: New Yorker University Press.

Yang, G. (2013). *The Power of the Internet in China*. London: Columbia University Press.