The Empowerment of Singleton Daughters? Exploring the Gender Digital Divide among

Chinese College Students

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Abstract

Studies based on research in Western countries usually argue that a gender difference exists

in terms of Internet usage. The gender digital divide is exacerbated by China's son preference.

In this explorative study, we find that the gender digital divide is narrowing because the

implementation of China's family planning policy has greatly enhanced the status of girls in

the family. Based on survey data, our research finds that female college students from

only-child families have significantly exceeded the average in terms of the amount and depth

of Internet use, particularly in some aspirational Internet usages that are capital-enhancing.

On the other hand, this research also finds that female college students from multichild

families are the most disadvantaged.

Keywords: gender digital divide; the one-child policy; aspirational use

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With the development of information and communication technology (ICT), Internet use has become deeply integrated into people's day-to-day activities. In addition, digital technologies could potentially enable women to overcome longstanding inequalities by providing employment opportunities and chances to increase income as well as access to cost-effective health care and education (Antonio and Tuffley, 2014). However, access is necessary, but not sufficient, to close the gender digital divide (Hafkin and Huyer, 2007). Empirical studies clearly show that even when women have access to a computer and the Internet, they are still at a natural disadvantage regarding Internet usage, as a result of entrenched sociocultural attitudes about the role of women in society (Antonio and Tuffley, 2014). Women living in developing countries often suffer more gender-related discrimination than their counterparts in developed countries; they are more likely to be unemployed and have fewer employment and educational opportunities, which leaves them in the role of unpaid family workers (Antonio and Tuffley, 2014). These women are trapped in traditional family roles and lack the basic digital literacy skills that could allow them to actualize more of their potential. Moreover, in most developing countries, media and society define the roles of women in traditional culture; even in educated families, women are not generally encouraged to fulfill their individual needs or pursue self-growth (Hilbert, 2011).

Such role definition underlies many of the reasons that women do not make ample use of technology. Studies suggest that the discrimination women face in many aspects of social life—employment, literacy and income—replicates inequalities in ICT usage (Ono and

Zavodny, 2007). As a result, gender inequality at the societal level is closely associated with a gender gap in computer use at home, and pre-existing measures of economic and social inequality are reasonable predictors of inequality in IT usage (Ono and Zavodny, 2007).

However, in China, the one-child policy may play a vital role in changing such gender norms, even though the patriarchal, patrilineal, patrilocal, and familial values of Confucian ideals have been characteristic of Chinese life and values for centuries and son preference has existed for thousands of years (Fong, 2002, Ming and Rich, 2002, Deutsch, 2006, Howell et al., 2017). Having only one child released mothers from the heavy burden of taking care of many children, such that females could be treated more equally in the job market and singleton girls could also enjoy more parental investment—especially in educational attainment—due to the lack of sibling competition. Singleton daughters enjoy unprecedented parental support and excel in the areas of academic performance and task-oriented programs (Fong, 2002, Ming and Rich, 2002).

Hence, the question arises of whether singleton female students display equal or better performance than male students in terms of ICT usage. The core of the digital revolution is the question of access to digital networks and, in particular, who is empowered and who is informationally marginalized by the use of these new tools. The gender digital divide has been discussed in many studies, with the common idea being that women in developing countries are at a disadvantage because of gender norms (Antonio and Tuffley, 2014). We are interested in whether the singleton daughters resulting from China's one-child policy could, to some extent, break through the digital divide predicament.

Gender Digital Divide

The digital divide is defined in early studies as the gap between those who have access to vital ICT resources and those who do not (Dimaggio et al., 2004). The term "access" in regards to the digital divide was initially used to refer to whether or not a person could connect to the Internet. Then, access later became a synonym for "use" (Dimaggio et al., 2004). Van Dijk extended conceptualization of the digital divide to four dimensions: attitude, access, skills, and types of usage (Dijk and Hacker, 2003). The dimension of usage refers to the idea that some Internet activities are considered to be more beneficial to people than others regardless of how much time they spend on the Internet. Currently, even though the physical access divide has generally diminished as ICT infrastructure has improved, significant differences may remain in terms of Internet use, and these differences are influenced by many factors, such as gender and social-economic status (Zillien and Hargittai, 2009a, Van Deursen and Van Dijk, 2014b, Blank and Groselj, 2014, Antonio and Tuffley, 2014).

In particular, the digital gender divide has long been considered one of the most significant inequalities brought about by the digital revolution (Moolman et al., 2007). Early studies found that men owned computers before women did and had easier access to the Internet (Cooper, 2006). Especially in developing countries, women were not using the Internet to the same degree as men (Antonio and Tuffley, 2014). In Guinea, Djibouti, Nepal, India, and Greece, less than 25% of Internet users are women (Hafkin and Huyer, 2007). Researchers have tried to determine the causes of the digital gender gap. The first reason proposed was that women were seen as being more likely to be technophobic (Martin, 2011); in other words, women held negative attitudes toward ICT (Varank, 2007). Second,

socioeconomic differences were considered to be a reason for the gender gap in ICT usage (Bimber, 2000). Because they had less money and control than men, women's access to the Internet was limited. For example, studies in West Africa showed that men monitored the cell phones and Internet use of their partners (Hafkin and Huyer, 2007). Time constraints also prevented women from using the Internet, as they were responsible for most of the housework (Hafkin and Huyer, 2007).

However, recent evidence has shown that women are catching up with regard to Internet access, and the longstanding disparity may be reversing to favor women over men (Ono and Zavodny, 2003, Talukdar and Gauri, 2011). It is evident that with the universalization of Internet technology in many parts of the world, the first-order gender digital divide has been bridged, if not reversed, particularly in developed countries.

Nevertheless, women appear to be more disadvantaged than men in terms of technology competency. A meta-analysis of empirical studies shows that males still enjoy a more confident attitude toward technology use, especially on the dimension of belief and self-efficacy (Cai et al., 2017). The analysis also pointed out that female college students' attitudes toward ICT might be more positive than those of the general female population (Cai et al., 2017). However, among Chinese college students, men were found to be more self-confident than women in terms of computer skills and were more likely than women to express the opinion that using computers was a male activity and skill (Li and Kirkup, 2007). Moreover, men and boys exhibited greater sex-role stereotyping with regard to computers, higher computer self-efficacy, and more positive affect about computers than did women and girls (Whitley, 1997). Research has also detailed a variety of ways in which women lag

behind men in the development of technological skills. For example, men own computers and use both computers and the Internet more than women do; men also spend more time online, take more technology classes, and show more motivation to learn digital skills (Dixon et al., 2014).

With the narrowing of the Internet access divide, researchers have found some gender-related differences in terms of Internet usage (Liff et al., 2008, Attewell, 2001, Hargittai and Hinnant, 2016, Peter et al., 2007, Van Deursen and Van Dijk, 2014b). Different genders have shown preferences for specific Internet applications. For example, males have been shown to use the Internet mainly for entertainment and leisure purposes, whereas women use it primarily for interpersonal communication and education (Weiser, 2000). Adult males in the Netherlands are found to spend more time on news and leisure and to use the Internet more overall (Van Deursen and Van Dijk, 2014b). There is also evidence that while adult females are more likely to use the Internet's communication tools, adult males are more likely to use the Internet for information, entertainment, commerce, and online gaming (Subrahmanyam et al., 2001, Schumacher and Morahanmartin, 2001). Women were significantly more likely to use SNSs than were men (Haight et al., 2014).

Studies have proven the existence of usage differences between female and males, and some have demonstrated that gender gaps put women at a significant disadvantage (Hafkin and Huyer, 2007). In addition to socioeconomic reasons for gender gaps, women may lack training, and online content may not reflect female interests and needs (Arun and Arun, 2002). Evidence from Britain showed that British females were disadvantaged in that they were less likely to engage in five types of use: entertainment, info seeking, email,

production, and classic media. Furthermore, females also engaged in less use overall and less variety of use than males. Additionally, women perform fewer activities online than men do (Blank and Groselj, 2014).

Considering all of this evidence, the literature about the gender digital divide is inconclusive. However, there is consensus among researchers that gender norms about men's control of technology and women's family status limit women's opportunity to learn, use and benefit from technology (Hafkin and Taggart, 2001).

The Empowerment of Singleton Girls

China's one-child policy, which began in 1979 as a national mandatory plan to control population growth, has been one of the largest and most dramatic population-control campaigns in the world (Settles et al., 2013). The policy successfully slowed population growth from 11.6% in 1979 to 5.9% in 2005 in the PRC and reduced the population by an estimated 250-300 million. At the national level, the rate of singleton births rose from 20.7% in 1970 to 72.4% in 2003 (White and White, 2012). Much of the Western literature on China's one-child policy has focused on its negative effects, such as abortions and sterilization of women due to the compulsory fertility limitation (Aird, 1990, Coale and Banister, 1996). However, several unintended consequences of the one-child policy have had an impact on the social and economic situation in China and on family processes and dynamics, as seen in the unbalanced sex ratios and urban-rural ratios of newborns, the changing of family and kinship structure, the acceleration of population aging, the form and stability of marriages, the norms of family and intergenerational relationships, and the socialization of the only child (Settles et al., 2013). A few researchers have noticed the

potential empowerment of daughters/girls (Fong, 2002, Ming and Rich, 2002).

Traditionally, Chinese parents have shown preferential treatment for sons over daughters (Greenhalgh, 1985). In the Chinese patrilineal family system, sons have higher value because they continue the family line, stay with their parents, care for them in old age, and contribute to ancestral rituals. Thus, parents had greater incentives to invest in their sons than in their daughters (Ling, 2017). However, the 40-year mandate of the one-child policy has not only created the reality that most Chinese families only have only one child for support and care in later life but also changed Chinese people's perceptions of the traditional norms of child rearing (Nie and Wyman, 2005)(Li, 2003).

In general, children in one-child households enjoy significantly improved opportunities for education compared to children in multiple-child households. The improvement for female students has been larger than that for males (Ming and Rich, 2002). In particular, because singleton female students do not have to compete with brothers for parental investment, especially in education, the one-child policy may have inadvertently improved the intrahousehold status of female children and enhanced their share of intrahousehold resources, thereby contributing to greater equality between the genders (Ming and Rich, 2002) (Fong, 2002). To summarize, the one-child policy not only changed the perception of the son preference to some extent but also eliminated the chance for parents to show a son preference in a one-child family, such that singleton girls enjoy both psychological care and material support from their parents.

Theoretical Foundation

Bourdieu and Passeron's (Bourdieu and Passeron, 1977, Bourdieu and Passeron, 1990)

social reproduction theoretical framework, which suggests that technological innovation reinforces existing power relations and modes of consciousness that legitimize those relations, has been applied widely in the digital divide research (Kvasny and Keil, 2006, Selwyn, 2004, Livingstone and Helsper, 2007, Kvasny, 2005, Ignatow and Robinson, 2017). There are three important requirements for Internet use: economic capital to acquire the supporting means (e.g., a personal computer and Internet subscription); social capital to learn how the Internet is used; and cultural capital to cope with the large and diverse amount of available content (Bourdieu, 1984). Resources, utility values, and literacy jointly affect individuals' Internet use behavior. Meanwhile, the gender use gap is also the result of both socioeconomics and some combination of underlying gender-specific phenomena (Bimber, 2000).

As discussed above, the one-child policy changed those gender-specific phenomena. For example, innate inequality between sons and daughters with respect to four socioeconomic resources—education, occupation, income, and property—and three areas of personal autonomy—job selection, residence, and control over income—has been changed to some extent because of the gender pattern produced by the one-child policy. Singleton girls, compared to girls with siblings, can more easily receive greater support from their families in the form of both economic resources and social resources, thus enhancing their capital and enabling them to use the Internet successfully. For sons, the one-child policy may play little part in empowering singleton males because sons could always gain parents' support even when there were many children in their families. This study aims to explore the following research questions.

RQ1. Is there a gender digital divide among Chinese college students in terms of

Internet usage?

RQ2. How do singleton and nonsingleton students use the Internet differently?

Method

Sample

Data for this study were collected at Southwest Jiaotong University and Hubei Second Normal University. Surveys yielding a sample of 865 students were conducted between March 15 and April 3, 2017. There were 811 valid questionnaires. A total of 54 respondents refused to give their basic information and were excluded from the analysis.

In the sample, respondents were more likely to be nonsingleton female students (n=308, 38%), followed by singleton female students (n=271, 33.4%), singleton male students (n=139, 17.1%), and nonsingleton male students (n=93, 11.5%). In terms of residence, more than half of the respondents were living in rural areas (n=529, 65.2%).

Measures

The questionnaire design principally referenced the "From digital skills to tangible outcomes (DiSTO)" project (van Deursen et al., 2016). The original questionnaire was translated, refined, and culturally modified for the Chinese context by a panel of three scholars.

Amount of use.

Amount of use is a widely used measurement of one dimension of Internet use, referring to the length of time spent on the Internet. In our questionnaire, amount of use was defined in terms of use duration. All respondents were asked how many hours they spent online each day at school.

Internet usage classifications.

Researchers have tried to classify different types of use on a conceptual basis but have failed to reach an agreement (Van Deursen and Van Dijk, 2014b). While some studies are based on a particular theory, others use a descriptive and inductive approach that derives classifications from factor analyses of the steadily growing list of Internet activities (Blank and Groselj, 2014). Generally, Internet usage classification at a theoretical level is still incomplete, and when there is a lack of theory, factor analysis is an effective method by which to identify usage clusters. In this study, the respondents were asked about three specific types of Internet usage activities: informational, educational, and social media. We created a list of 32 items representing diversified online activities including anything from leisure to seeking information to education to chatting (see Table 1 for the complete list) and asked respondents how often they engage in each of the Internet activities. Respondents answered on a 6-point Likert scale, where "never" = 0 and "more than once per day" = 5. Because of the lack of a theory-driven analytical framework for these items, exploratory factor analysis (EFA) was conducted to find the usage cluster of each type. We performed principal components analysis (PCA) of the activity variables with varimax rotation and Kaiser normalization. Three factors were identified for each type of use, which we labeled as utilitarian, exploratory, and aspirational activities, as shown in Table 1. Utilitarian refers to tasks required for daily life. Exploratory refers to seeking new information without a specific goal, or "seeing what is out there." Aspirational refers to seeking information to better oneself, or looking for ways of self-actualization. Then, we used the Z-score factor variable to replace the original variable for analysis.

Informational use. There were 12 items describing information-related activities. Utilitarian informational use is dominated by the following activities: browsing national and international news, getting information about local events, browsing sports information, browsing the latest tech news, and browsing the latest financial news. These types of news provide basic information for daily living and are mostly pushed by web pages or apps, which are used by those who take less initiative in choosing what they see. Exploratory informational use is dominated by looking for information about other people, looking for the latest celebrity news, looking something up to help settle an argument or disagreement, and looking for comedy, cartoons, or other humorous video content. Because people engage in these activities without a specific goal, they are "seeing what is out there" or looking at information outside of their interests. Aspirational informational use is dominated by looking for jobs, making travel plans, and finding information about health or medical care. These activities require people to make a clear plan to find the information that satisfies their needs.

Educational use. There were 7 items describing education-related activities. Utilitarian educational use is dominated by searching for or verifying certain knowledge points, searching for the definition of a word, viewing topics related to a course, and finding information in order to complete college assignments or course papers. These activities are basic educational tasks required of students in their daily lives. Exploratory educational use is dominated by participating in remote e-learning for credit (MOOC, Bibo, Erya, etc.), watching or downloading online lessons (Netease Open Class, TED, etc.), and video learning online. Aspirational educational use is dominated by searching for and downloading academic literature or professional books. These activities help students to perform well in

their academic fields and to engage in learning for the purpose of self-development.

   Social media use. There were 13 items describing social media activities. Utilitarian social media use included 6 items: updating your status on a social network to share with your circle of friends, sending your own photos to friends via social networking sites, sending your own posts, thoughts, articles, etc. to social networking sites, evaluating the status of other friends' circles, liking other people's circles of friends and QQ space information, and forwarding and sharing other people's articles, videos, news, etc. These activities are utilitarian because people do them as a habitual part of life in order to socialize with others. Exploratory social media use included 3 items: watching news or other information on social networking sites, paying attention to and viewing public figures, and opening a URL link on a social networking site. These activities were considered exploratory because people view social websites, apps, and shows in a way that is not goal-oriented. Aspirational social media use included 4 items: participating in discussions of political issues, removing people from your list of friends, updating personal information on social networking sites (such as address or occupation), and checking and changing privacy settings, such as changing what is visible to different members of one's circle of friends. These activities were considered aspirational because they are advanced enough that they require sophisticated Internet skills and the initiative to share one's personal opinion.

Table 1

Usage Classification

Factors		Items	Factor loadings	α
Informa -tional Use	Utilitarian Activities	Browse national and international news	0.794	0.792
		Browse information about local events	0.761	
		Browse the latest financial news	0.680	
		Browse sports information	0.670	
		Browse the latest tech news	0.624	
	Exploratory Activities	Look for information about other people	0.762	0.669
		Look for the latest celebrity news	0.745	
		Look something up to help to settle an argument or a disagreement	0.618	
		Look for comedy, cartoons, or other humorous video content	0.596	
	Aspirational Activities	Look for jobs	0.768	0.622
		Make travel plans	0.724	
		Find information about health or medical care	0.572	
Educati- onal use	Utilitarian Activities	Search for the definition of a word	0.832	0.841
		Search for or verify certain knowledge points	0.827	
		Find information in order to complete	0.815	

		college assignments or course papers		
		View topics related to a course	0.707	
	Exploratory Activities	Participate in remote e-learning for credit (MOOC, Bibo, Erya, etc.)	0.947	0.709
		Watch or download online lessons (Netease Open Class, TED, etc.) or video learning	0.600	
	Aspirational Activities	online		
		Search for and download academic literature or professional books	0.881	
Social media use	Utilitarian Activities	Update social network status, such as circle of friends	0.766	0.816
		Send your own photos to social networking sites and friends	0.751	
		Send your own sentences, thoughts, articles, etc. to social networking sites	0.718	
		Evaluate the status of other friends' circles	0.693	
		Like other people's circle of friends and QQ space information	0.541	
		Forward and share other people's articles, videos, news, etc.	0.523	
	Exploratory	Watch news or other information on social	0.806	0.653

Activities	networking sites			
	Pay attention to and view public figures	0.796	
	Open a URL link on a social networking site	0.540	
Aspirational	Participate in discussions of political issues	0.731	0.723
Activities	Remove people from your friends list	0.713	
	Update personal information on social networking sites, such as address or occupation	0.697	
	Check and change privacy settings such as circle of friends (to change what is visible to whom)	0.643	

Note. Extraction Method: Principal Components Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 5 iterations.

Results

Differences in amount of use

Mean-comparison tests were conducted to analyze the differences in amount of use during different durations of Internet use, as seen in Table 2. First, we control for the singleton factor by considering whether the gender of a college student generally has a significant influence on the length of time spent surfing the Internet. In general, female students spend more time on Internet use than do males (t=1.82, p<0.05). Second, we control for the gender factor, considering whether being a singleton college student has a significant

influence on the length of time spent surfing the Internet. It appears that there is no statistically significant difference between singleton and nonsingleton students in terms of the length of time online.

Table 2

Mean amount of use

	Female	Male	Total
Singleton	5.51	4.97	5.33
Nonsingleton	5.45	4.78	5.29
Total	5.47	4.88	5.31

Exploring the differences among types of use

To explore the different types of Internet use the students engaged in, we conducted a two-way ANOVA using the gender and singleton variables and considered whether there was interaction of singleton status and gender. The mean of score of each type is reported in Table 3.

The two-way ANOVA identified significant interaction effects among gender and singleton status in aspirational education use ($F=3.57$, $p<0.1$) and exploratory social media use ($F=9.25$, $p<0.05$). Interaction effects for other Internet uses were not significant. As depicted in Figures 1-2, we could clearly see that for singleton children, female students had more frequent aspirational education use and exploratory social media use than did male students. In contrast, for nonsingleton children, male students had more frequent aspirational education use and exploratory social media use than did female students. Overall, the

significant interaction effect indicates that women's behaviors in aspirational education use and exploratory social media use, which are more advanced types of use, vary depending on whether the woman is a singleton child.
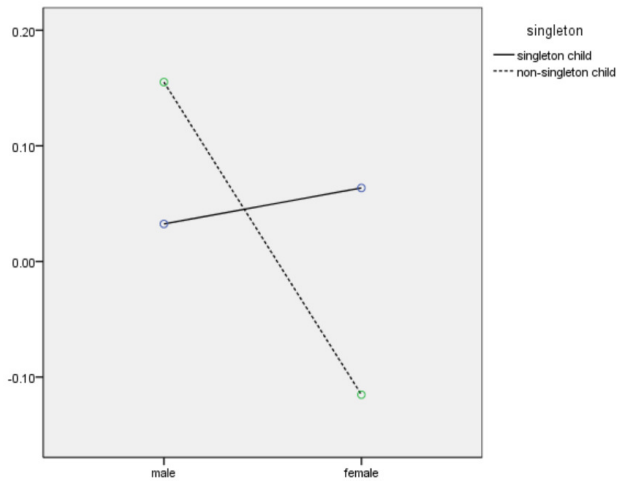

Figure 1. Estimated marginal means of aspirational education use
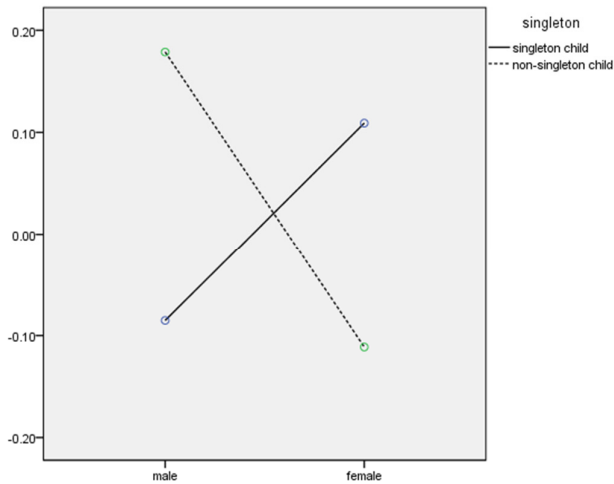

Figure 2. Estimated marginal means of exploratory social media use

The main effects of singleton status were not significant in any type of use. However, the main effects of gender were significant in informational utilitarian use (F=66.70, p<0.01), informational exploratory use (F=31.31, p<0.01), informational aspirational use

(F=5.64,p<0.05), educational utilitarian activity (F=4.65, p<0.05), social media utilitarian activity (F=10.37, p<0.01), and social media aspirational activity (F=15.03, p<0.01). T-tests for two independent samples were further conducted to analyze the differences in Internet usage between female and male students. Male students had significantly more frequent informational utilitarian activity (t=8.29, p<0.001), informational aspirational activity (t=2.23, p<0.1) and social media aspirational activity (t=3.84, p<0.001) than did female students. Male students had significantly less frequent informational exploratory activity (t=-5.70, p<0.001), educational utilitarian activity (t=-2.13, p<0.1), and social media utilitarian activity (t=-3.32, p<0.01) than did female students.

Table 3

Mean of score of each type

	Informational use			Educational use			Social media use		
	Utilitarian	Exploratory	Aspirational	Utilitarian	Exploratory	Aspirational	Utilitarian	Exploratory	Aspirational
Singleton female	-0.089	0.212	-0.005	0.134	-0.016	0.063	0.121	0.109	-0.028
Singleton male	0.431	-0.343	0.055	-0.118	-0.058	0.032	-0.218	-0.085	0.251
Nonsingleton female	-0.262	0.051	-0.091	-0.029	0.009	-0.115	0.035	-0.111	-0.147

Nonsingleton male	0. 464	-0.267	0.227	-0.120	0.104	0.155	-0.135	0.178	0.185
Female		-0.180	0.127	-0.050	0.047	-0.002	-0.031	0.075	-0.091	-0.009
Male		0.444	-0.312	0.124	-0.119	0.005	0.081	-0.184	0.022	0.224

Then, we used T-tests for two independent samples to further analyze the performance differences of singleton female and male students in utilitarian, exploratory, and aspirational activities. First, male students had significantly more frequent informational utilitarian activity than did singleton female students (t=-6.23, p<0.01), while male students had significantly less frequent education (t=2.93, p<0.01) and social media utilitarian activity (t=3.37, p<0.01). Second, in terms of exploratory activity, there was no significant difference between singleton female and male students in educational and social media exploratory use. Singleton female students had significantly more frequent informational exploratory activity (t=5.96, p<0.01). Finally, it was found that singleton female students did not differ from male students in informational aspirational activity and educational aspirational activity, while singleton female students still made less use than male students of social media aspirational activities (t=-2.74, p<0.05).

Based on the results, we drew the conclusion that the gender digital divide still exists for some Internet use involving greater initiative and purposefulness. Compared to females, male students still differentially participated in aspirational informational use, aspirational educational use, and aspirational social media use, which indicates that women are still in a disadvantaged position. However, we found that singleton female students showed no significant differences from male students in aspirational activities of information and

education use, which means that singleton female students have caught up with male students in these activities. Moreover, singleton female students showed disproportionate use of social media and informational exploratory activities. In addition, the existing gender divide and the more powerful singleton female students implied that nonsingleton female students were less frequently involved in aspirational Internet activities and were the most disadvantaged group.

Discussion

Digital divide researchers have suggested that some types of Internet usage are more capital enhancing than others and have argued that socioeconomic status is usually associated with different Internet usage patterns (Witte and Mannon, 2010, Zillien and Hargittai, 2009b, van Deursen et al., 2015, van Deursen and van Dijk, 2014a, Pearce and Rice, 2013). For example, Dimaggio and Hargitti (2001) found that data from the 2000 US Comprehensive Social Survey showed that users with high education levels, high incomes, and high scores on cognitive tests were more inclined to use the Internet to "accumulate capital" than to simply use it for entertainment. Bonfade's research on Swiss data from 1997 to 2000 also shows that users with high education levels and high incomes generally use the Internet for activities that provide economic benefits, while users with low social and economic status use the Internet more for entertainment. However, there is a lack of consensus on the classification of capital-enhancing and non-capital-enhancing Interment activities. As a matter of fact, given the multipurpose nature of many Internet activities, it might be misleading to simply apply the capital-enhancing and non-capital-enhancing dichotomy to a specific type of Internet activity.

In this paper, we used EFA to cluster the varieties of Internet activities into three

types: namely, utilitarian use, exploratory use and aspirational use. Intuitively, the three identified types of Internet usage require different degrees of user initiative

Indeed, it is impossible to judge whether some Internet activities (mostly utilitarian and exploratory uses) will increase or reduce capital. However, it appears reasonable to assume that most aspirational use, such as searching academic literature, is a valuable way that college students take initiatives to improve themselves. To that extent, we argue that initiative provides a useful lens through which to classify Internet usages.

In our sample of college students, females—regardless of singleton status—were found to spend significantly more time on the Internet than males. The result is consistent with earlier research studies (Antonio and Tuffley, 2014), which found that highly educated women will make as much use of the Internet as men.

Although female college students had more exposure to the Internet than male students, we found that this was distinguished on Internet usage behaviors. Previous studies indicated that men engage more frequently in information-related activities, while women often use the Internet for education and SNSs (Subrahmanyam et al., 2001, Schumacher and Morahanmartin, 2001). Our results specific to information, education and social media utilitarian activities were coincident with these findings.

However, women specifically lagged behind on information, education and social media aspirational use.

However, there was no significant difference between the singleton female and the average male in the case of aspirational information use; singleton female students did not significantly differ from male students in educational aspirational activity. Aspirational social

media use is significantly more common among singleton girls than nonsingleton girls, but singleton girls had less frequent use than average of boys, which means the extent of singleton girls' social media involvement is still not the same as that of boys. Compared to other types of use, aspirational Internet activities involve more self-selection and clear purpose when individuals are using the Internet. Singleton girls were found to engage at the same frequently as males in informational and educational aspirational activities, on one hand, because the parents of only children usually have high expectations and encourage their children's academic achievement, and parents of only children devote more time than do parents of children with siblings to helping their children with their studies. The large number of one-daughter families resulting from China's one-child policy has fueled heavy investment in the education and well-being of girls. The improvement opportunities for education for singleton girls was larger than that for boys (Ming and Rich, 2002). In turn, singleton girls perform better in the ICT activities that can help them to accumulate the advantages produced by the one-child policy. On the other hand, without brothers competing for family resources and parents' attention, these singleton daughters have less chance to develop inferiority complexes (Ming and Rich, 2002). Singleton children were rated higher by their teachers on positive personality variables (Poston and Falbo, 1990). Feng (2000) also found that singleton children were more advanced in their abilities than children with siblings; they were more likely to have new friends, likely to be more easy-going, and less likely to be alone. Singleton children were more advanced than nonsingleton children in sociability, competition, and cognitive self-estimation. At four universities in Guangzhou, their psychological characteristics and health were significantly better than those of nonsingleton children.

Long-term personality outcomes appear favorable to the only child (Settles et al., 2013). Therefore, singleton females are empowered to develop their character and perform better than nonsingleton females. These favorable outcomes are reflected in only-child ICT usage and thus empower singleton girls in ICT usage. In conclusion, singleton status boosts the frequency of aspirational informational use, aspirational educational use and exploratory social media use among women.

However, correspondingly, nonsingleton girls are the most disadvantaged group. China's family planning policies have followed a dual track along the entrenched rural–urban divide. Rural residents are allowed to have a second child if the first one is a daughter: this is the so-called "one-and-a-half-child policy." In reality, wanting at least one son often leads to a second, and even a third or fourth child, until a son is born, creating sequences that begin in possibly multiple daughters and terminate in a solitary male. In rural areas, the girls born into families with brothers are asked to help the brother in the family, especially with regard to financial help (Oreglia & Srinivasan, 2016). Because of the economic burden caused by brothers and the lack of parental investments, nonsingleton girls less frequently engaged in aspirational use. At the same time, since nonsingleton males are often the only son and typically are the youngest in their families, such elder-daughter(s)–younger-son family structures imply that daughters receive less parental care, financial support, material comfort and educational opportunities, while sons from multiple-child families receive not only more parental care but also support from their elder sisters. Therefore, nonsingleton males performed better than other groups in almost all the Internet usage categories. To that end, the one-child policy merely eliminates the chance for parents to act on their son preferences but

does not eliminate patriarchal system.

Conclusion

This research examines the gender digital divide among college students, which is a highly homogeneous group in terms of education and age. Previous studies in Western countries have usually considered women to lag behind men in their amount and types of Internet use. Women tend to use entertainment and social applications, while men prefer business and financial applications. Meanwhile, the digital divide caused by gender is exacerbated by China's son preference, especially in poor and rural areas. However, China's 40-year family planning policy has greatly enhanced the status of girls in the family. Singleton girls have enjoyed exclusive family resources, received better education and achieved higher social status. In our sample, female college students from only-child families have exceeded the average of male college students in some Internet applications, which are apparently capital-enhancing. However, female college students from multichildren families were still found to be in the most disadvantaged position.

Recently, as China's aging population has continued to grow, the Chinese government has gradually relaxed the one-child policy and implemented a comprehensive two-child policy. Many families have chosen to have more children, even if the cost of having children and raising them is high. According to this study, the singleton factor is the salient variable in Internet use. We worry that with the further liberalization of China's fertility policy, the number of families with multiple children will increase and that women in families with many children will be in a disadvantaged position. It remains to be seen whether the use of the Internet will be affected and whether gender inequality will increase.

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