

The Spatial Relationship between Social Media, Digital Connectedness, and Social Isolation in China: Revisting Cyber-Optimism

Jason Gainous*

Andrew W. MacDonald†

2023-06-22

Early research and popular discourse on the promise of the internet was optimistic. Many believed it would promote social interconnectedness and, ultimately, be a positive force in people's lives. Since these early predictions, research has become much less positive, usually pointing to the negative aspects of social media. Here we test whether the digital environment can actually create a space that deters feelings of social isolationism especially for those living outside cities in restrictive information environments where citizens are often disconnected from the outside world. Using data from a nationwide survey of Chinese citizens we conducted in 2015, we do find that the more citizens digitally connect with others, the less personally isolated they feel, but that this relationship is less pronounced for those in rural communities. Conversely, though, the more likely people are to move relationships from online to offline, and the more they use social media, the more personally isolated they feel. These counter-relationships are more pronounced for those in rural communities. Generally, those living in urban environments tend to feel more isolated, and digital connection does not seem to mediate this spatial factor. In fact, it exacerbates loneliness.

Social Isolation in China

Introduction

Research is quite mixed when it comes to identifying the relationship between social media use and feelings of isolationism. Early research suggested that the internet would build social

*University of Louisville, jason.gainous@louisville.edu

†Duke Kunshan University, andrew.macdonald@dukekunshan.edu.cn

capital, or an interconnectedness between people, and that social media platforms were the ultimate way to bring people together. Since then, research indicates that the effect may be the opposite for many. Social media may encourage social isolation, and ultimately, social media users may feel more disconnected from others than those who do not use social media. We know very little about this phenomenon in China. China presents an interesting case because the institutional structures, level of development and the cultural context are all quite different than the areas studied in most existing studies. This allows us to test whether such features moderate or exacerbate the relationship between social media use and social isolation. To fully test this theory, we employ a large survey of Chinese internet users and test a variety of regression specifications. The main result is that social media use is robustly negatively related to social isolation, though the nature of this relationship changes depending on the urbanicity of the respondent - being in a rural area amplifies this relationship.

Literature Review and Theory

The existing literature on social isolation and social media use generally finds a negative relationship between the two. However, there are some remaining questions regarding whether this relationship remains significant in different cultural and regulatory environments. Based on the existing literature, we then develop some testable hypotheses regarding how the relationship between usage and isolation may vary in the context of China. The result of these hypotheses tests will help to better understand the mechanism that links the two variables.

Initially, scholars imagined that social media would create more opportunities for users to create unique and fulfilling social relationships. The early theorizing about the possible benefits of social media hypothesized three important mechanisms by which social media could decrease loneliness. 1) creating more opportunities for online to offline meetups and 2) helping to alleviate feelings of isolation for those who have difficulty making in-person social connections via joining an online communities, and 3) facilitating keeping in touch with family and friends (Ellison, Steinfield, and Lampe 2007; Steinfield, Ellison, and Lampe 2008; Subrahmanyam et al. 2008).

More recent studies on the subject have found significantly more mixed and often negative evidence regarding the impact of social media on feelings of isolation. Primack et al. found a negative relationship between social media use and social isolation in youth in a representative sample (Primack et al. 2017). A meta-review of the literature on adolescent social media usage notes that while the effect size is often small the relationship in most studies is negative (Valkenburg, Meier, and Beyens 2022). There are relatively fewer studies that consider all ages. However, those that have been conducted also generally find a negative (if modest) relationship (Appel, Marker, and Gnambs 2020). More recent research has suggested that the effect of social media on measures like social isolation may be highly heterogeneous across individuals, a finding that would help reconcile some of the discrepancies in the literature (Beyens et al. 2020; Ostic et al. 2021).

While most of the studies agree that the causal direction flows from social media use to feelings of isolation (though see (Nowland, Necka, and Cacioppo 2018; Kim 2017)), there is disagreement among authors about the specific mechanisms and causal pathways through which this relationship exists. One set of mechanisms find that the social media itself that is the problem. Cyberbullying, or more generally, repeated and aggressive online attacks against users has been systematically linked to feelings of social isolation (Ademiluyi, Li, and Park 2022). Upward comparisons of others and the weak nature of online connections has been found to generate social anxiety and social isolation (Alabri 2022; Büttner and Rudert 2022). Another set of mechanisms primarily concern themselves with the physical changes that social media causes. Social media use has been shown to displace face to face activity, which leads to greater social isolation (Larson et al. 2018). Heavy social media use also decreases hours of sleep, leading to greater feelings of anxiety and more social isolation (Twenge, Krizan, and Hisler 2017). The current research suggests that which of these mechanisms is dominant depends on the age/demographic group in question and the societal context (Twenge 2019).

Most of the existing research on the subject focuses on Western highly developed societies, and this focus may limit variation on key independent variables given the similar social and institutional context in which users are embedded. To address this problem, this study aims to understand how these complex dynamics interact in the non-Western setting of China. Relatively little is known about China’s level of social isolation, though what evidence that does exist suggests that it is on the rise. Twenge et al.’s study found that adolescent feelings of loneliness have generally been on the rise in comparable East Asian countries (Twenge et al. 2021). News reports have highlighted the increasing number of people who consider themselves to be online outcasts or losers (*diaosi*) (Nan 2013; Szablewicz 2014; “China’s Latest Social Media Trend: Diaosi / Loser Subculture” 2016). We do not aim to make a direct comparison between China and Western countries but rather highlight the way in which China’s unique context helps shed light on which contextual factors matter in understanding the linkage between the two variables.

The most important of these contextual factor in China is that social media space that is highly controlled online environment. Many people are aware that the Chinese government heavily censors politically sensitive content on online platforms. However, fewer are aware that the Chinese government spends as much if not more effort to clean up non-political but negative or distressing content on the Chinese internet, such as scams, instances of cyber bullying, disturbing videos, and vulgar content (Wang 2020). This control impulse also extends content the government views as spiritually polluting, such as pornography, scantily dressed women, and other escapist content. While the Chinese government and online platforms are not 100 per cent effective in their ability to completely stamp out such content, the default is that such content is actively restricted, while US platforms tent to take a more pro-speech regulatory position (J. Liu and Yang 2022). If one of the main mechanisms through which social media promotes social isolation occurs is exposure to negative content, then this online environment should lead to a weaker relationship between social media use and isolation. Suggestive of this is a a study by Liu and Liu that finds those who consumed more commercialized and

sensationalized media reported more trauma during the first COVID-19 in China than those who followed government sources (C. Liu and Liu 2020).

On the other hand, China also has a highly robust online influencer culture. While social media influencers are a global phenomena, China has perhaps the most commercialized version of influencing. Social media influencers are developed by large agencies and work in an almost assembly-line fashion to promote products on livestreams or pitch sponsor products. In this influencer culture, less attention is paid to authenticity and personality and relatively more emphasis is placed on consumerism, brand promotion, and image (Tam 2019; Wei 2023). Given that previous research has suggested one of the main channels through which social media creates feelings of isolation is negative personal comparisons with online content (so-called “FOMO” - fear of missing out), heavy social media use may increase the strength of the relationship between social media use and social isolation.

Additionally, China’s social media environment is relatively unique in that the dominant messaging platform is also the largest social media app (WeChat). Users can use it simply to chat with family and friends, they can use it to post photos and other content about their life in a feed that works similarly to Facebook, or they can browse videos of others in a method similar to Tiktok. Previous research has indicated that while, on the whole, social media increases social isolation, for users that primarily use it to contact friends and family, its use can counteract the negative effects (Hajek and König 2019; Lim, Eres, and Vasan 2020). Given the ubiquity of WeChat in China, we expect to find similar results.

Finally, the nexus of social isolation and social media use in China has played out in the context of one of the most rapid periods of urbanization in human history. Hundreds of millions of people have shifted from rural subsistence farming to participating in an urban market economy. The existing literature finds that urbanicity is an important factor in levels and mechanisms for social isolation; many studies of Western societies have found that rural residents, while having stronger familial bonds, also can more easily experience social isolation without those bonds (Kaye 2017; Koning, Stathi, and Richards 2017; Henning-Smith, Ecklund, and Kozhimannil 2018). In China, less is known about the differential effects of the urban rural divide on feelings of social isolation but the research that does exist suggests that urban environments can be especially isolating, particularly for rural to urban migrants particularly due to lack of access to traditional support systems and familial connections (Li and Rose 2017).

Given the existing literature and the context of China, this leads to a series of testable hypotheses.

- **H1a:** social media use should have a weak or possibly positive connection to social isolation due to strengthened government control over online content
- **H1b:** social media use should have a negative connection to social isolation due to the dominance of influencer culture in China

- **H2:** those who are able to use social media to make new friends will have lower social isolation scores than those who do not
- **H3:** the urban/rural divide will produce differential impacts in the above hypotheses on the relationship between social media use and social isolation

Data, Measurement and Descriptives

The data from this study are original. We designed a survey instrument in English, and translated it into Chinese, to measure a range of concepts including social isolationism and various dimensions of social media and digital information consumption. We employed Qualtrics to collect the data. They randomly selected 2292 respondents from their existing panel¹ from November 25 to December 2, 2015. This sample size on provides for a roughly ± 2 margin of error.²

Our dependent variable, *social isolationism*, is a three-item additive index. Respondents were given the following introduction: The next question is about how you feel about different aspects of your life. Could you tell me for each one if you feel that way always, almost always, some of the time, rarely or never? Then they were asked: A) How often do you feel that you lack companionship, B) How often do you feel isolated from others?, and C) How often do you feel left out? Response options were recoded so that higher responses equated to feeling more socially isolated, they were all three added together, and then rescaled to range from 0 through 1 maintaining the original intervals ($\alpha = 0.86$). The distribution of that index is presented in Figure 1. The distribution is relatively normal centered around the midpoint with a slight skew to the right. Most respondents appear to be on the low end, indicating the the majority of those in our sample do not feel particularly isolated. Conversely, the right skew in the distribution does suggest that a sizable chunk of folks feel quite socially isolated. Altogether, the spread out distribution indicates quite a bit of variance ($\mu = 0.41$, $sd = 0.20$).

We have several primary independent variables including human interaction, online to offline relationships, general social media use, and urbanicity. We measured human interaction with a single item: “Has the internet and phone applications increased your contact with the following groups of people (check yes to all that apply)?” The response options were: 1) Family that lives nearby, 2) Family that lives far away, 3) Friends that live nearby, 4) Friends that live far away, 5) People you met on the internet that live nearby, and 6) People you met on the internet that live far away. We simply counted the number of selected responses so the item ranged

¹Qualtrics recruits a large pool of respondents for various survey projects through online advertising. Recruits who update their profiles at least once every 6 months are randomly invited to participate. These recruits are awarded online points that can be exchanged for cash or various other country-specific gifts. The number of points is based on the length of the survey, and since our survey had over fifty questions, respondents received a relatively high number of points.

²We were able to first collect a small sample ($n = 286$) to check the reliability and adjust the instrument after before proceeding with the final data collection. We made three adjustments, none of which are related to the measures used in the current study.

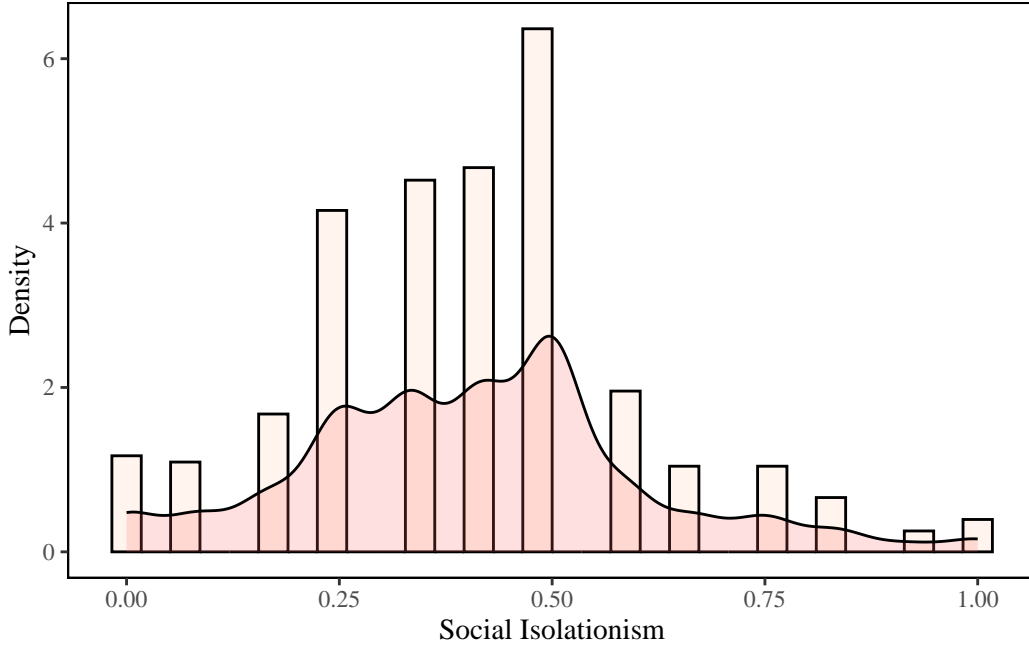


Figure 1: Distribution of Social Isolationism Index

from 0 to 6, and then for the models that come later, we rescaled it to range from 0 through 1 maintaining the original intervals. Online to offline relationships was also measured with a single item: Have you met someone offline that you initially met online? Response options were: 1) Yes, many times, 2) Yes, several times, 3) Yes, once, and 4) No, never. We inverted this scale so that higher values represented more offline relationships, and again, rescaled it to range from 0 through 1 for the models that follow.

The distributions of these ordinal independent variables are reflected in Figure 2. Very few people claimed to never have increased their contact/connections with others through the internet. The modal number of increased connections respondents claimed to have made through the internet was 2, followed closely by 1, but a sizable proportion of the sample, about 48% claimed to have increased their number of personal connections by 3 or more through the internet. Perhaps not surprisingly, the modal response when asked whether one had met someone online and that relationship moved offline was “No, never”. On the other hand, we were surprised that about 37% of those sampled claimed to have moved relationships offline several times, over 10% said they had done so many times, and about 13% did so once. Taken altogether, a large proportion of our respondents seem to using the internet to facilitate social relations.

We measured general social media use with an index based on the following three items: 1) About how many hours a day would you estimate you spend using only social media? Social media means applications like Weibo, QQ, Renren, Kaixin001, Douban, WeChat or other sites

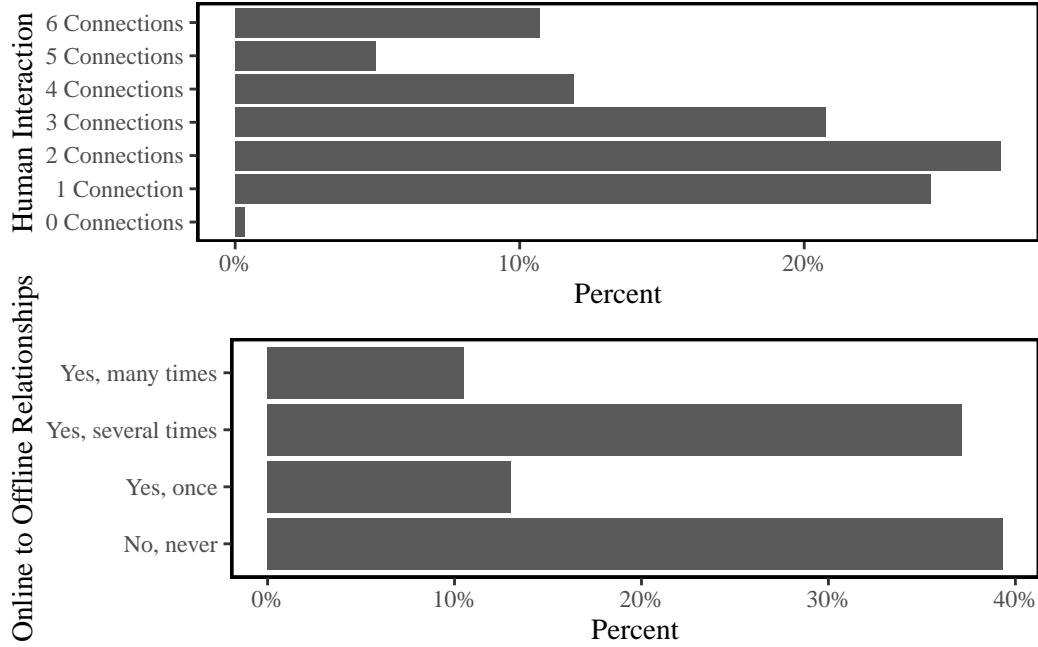


Figure 2: Primary Independent Variables Distributions

and services that allow users to interact with each other. (0-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8, 8-9, or More than 9), 2) Do you check email, read websites, and use social media (social media means applications like Weibo, QQ, Renren, Kaixin001, Douban, WeChat or other sites and services that allow users to interact with each other) more than you did five years ago? (Yes, No), and 3) How often do you read news stories about political events that have been posted on social media (social media means applications like Weibo, QQ, Renren, Kaixin001, Douban, WeChat or other sites and services that allow users to interact with each other)? (More than once a day, Everyday, Three-to-five days per week, One-to-two days per week, Less often, Never). Each was recoded so that higher values represented more social media use, rescaled to range from 0 through 1, added together, and then again, rescaled to range from 0 through 1 maintaining all original intervals. The distribution of this index is presented in Figure 3. The distribution is relatively normal and tightly centered around the mean 0.63 with a standard deviation of 0.17, but there is a left skew suggesting that a portion of the population is not that social media active, but clearly the bulk of the population are.

Our final primary independent variable, urbanicity, was measured using a single item: Which of these best describes the place in which you live? (Countryside/Village, Small City, Mid-Sized City, Suburban Area of a Big City, Big City). For the purpose of the models, we rescaled this item to range from 0 through 1 maintaining the original intervals. The distribution is reflected in Figure 4. Given the rural to urban Chinese migration since the founding of the People's Republic (Xia 1995), it is not surprising to see that nearly 45% of those in our sample live in

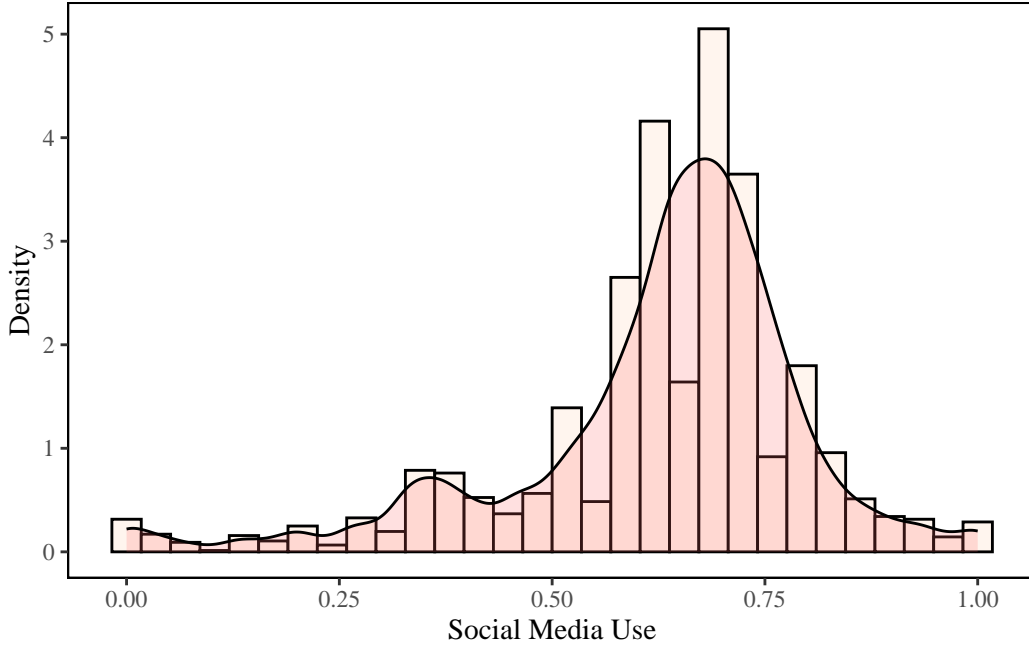


Figure 3: General Social Media Use Distribution

cities, 7% in suburbs, and about 27% in mid-sized cities. About 16% say they live in small cities and only about 5% say they live in villages.

Our modeling strategy that follows is straightforward. We begin by modeling each of our internet communication independent variables as function of socio-economic status (SES), gender, Chinese Communist Party membership (CCP), and age to create an individual profile of each type of digital user (see the Online Appendix for the operationalization of these variables). This provides some context for the models that follow which are intended to test our primary hypotheses, that is that internet communication can deter social isolation and that this is particularly true for those who do not have the convenience of the high social interaction opportunity provided by urban living. For those we begin by fitting an additive model of our index of social isolationism as function of each of our primary independent variables while also controlling for the same variables included in our profile models. Finally, we refit three models with the same specification but introduce an interactive term between each of our internet communication indicators, respectively, with our measure of urbanicity. This allows us to test whether the observed additive effects are stronger for those living outside cities.

Results

Given that the first two dependent variables (human interaction, online to offline to offline relationships) in our profile models are distributed ordinally, we initially estimate linear models

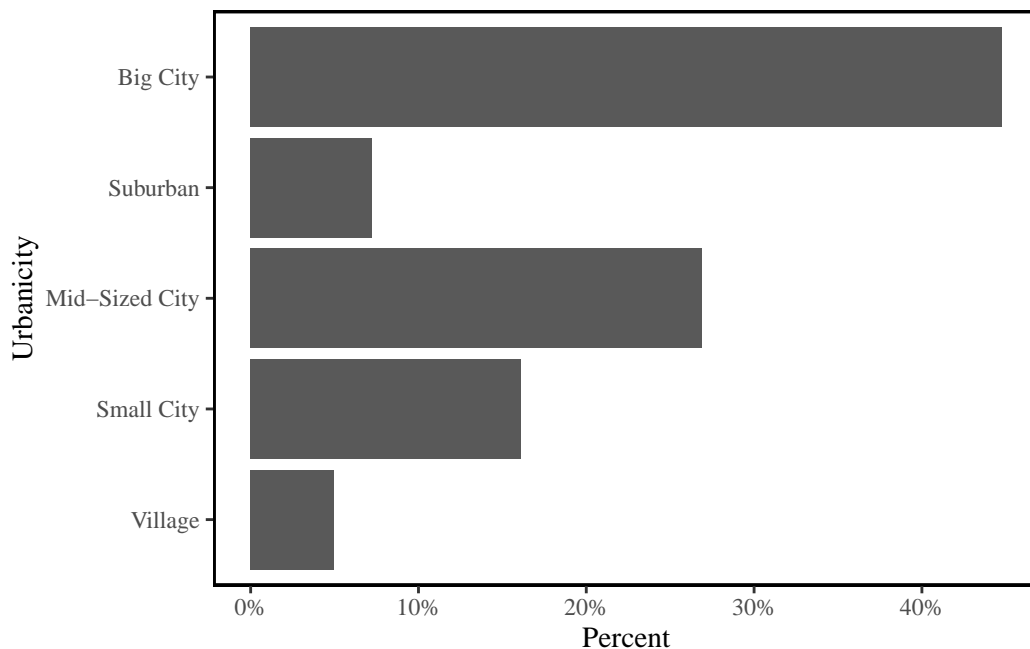


Figure 4: Urbanicity Distribution

of those outcomes and examine the residual behavior to determine if a linear model fits the data well or if an ordered outcome model is a better fit. The results were clear, a linear model is not a good fit for either outcome (see the figures in the Online Appendix), so we fit the models using ordered logit. Because our measure of general social media is based on an additive index, we treat it as continuous, and accordingly fit a linear model.

The results of our profile models are presented in Table 1. When it comes to SES, the relationship across all three of our internet communication is consistent. As SES goes up so does digital human interaction, the move from online to offline relationships, and general social media use. That gender is only statistically significant in the model of the move from online to offline relationships where women are less likely to do so. Interestingly, being a CCP member has inverse relationships with human interaction and the move from online to offline, where members are less likely to increase digital human interaction but are more likely to move online relationships offline. Finally, the older respondents were the more likely they were to increase human interaction, and the less likely they were to move relationships offline and use social media. These profile results provide background context for the models that follow. The internet communication indicators are our primary independent variables, so these profile models give us a sense for whom they matter the most when it comes to deterring social isolation.

The results of our models of social isolation are presented in Table 2. The additive estimates in model (1) provide mixed results regarding whether internet communication is a positive force in deterring social isolation. Not surprisingly, there is a negative relationship between the

Table 1: Modeling Profiles of Digital Communication

	Human Interaction	Online/Offline Interaction	General Social Media
SES	2.35* (0.27)	2.16* (0.28)	0.24* (0.03)
Female	-0.03 (0.08)	-0.35* (0.08)	0.01 (0.01)
CCP Member	-0.17 (0.09)	0.23* (0.09)	0.01 (0.01)
Age	0.51* (0.26)	-0.82* (0.27)	-0.12* (0.02)
N	2277	2276	2198
Pseudo R2	0.07	0.05	
R2			0.05

* $p < 0.05$ *Note:*

Human Interaction and Offline/Online Relationships estimates are derived from ordered logit and General Social Media from ordinary least squares.

number of digital connections (human interaction) folks make and feelings of social isolation. On the other hand, though, both moving online relationships offline and general social media use are positively related to feelings of social isolation. The latter is consistent with much of the literature outlined above, but the former is not. Perhaps, this is context driven. The results also indicate that those living in more urban environments tend to feel less socially isolated.

Models (2) - (4) in Table 2 include each of the interactions between our three internet communication measures and urbanicity. The consistent result across the interactions is that the relationships are dulled for those living in more rural areas. The interaction between digital human interaction and urbanicity is statistically significant ($p < 0.01$), as is that between the move from online to offline relationships and urbanicity ($p < 0.001$), and that between general social media use and urbanicity only slightly misses the arbitrary 0.05 threshold ($p = 0.07$). The interactions are most easily interpreted graphically (see Figure 5).

The model (2) results are graphed in the upper left hand figure. Here it is clear that the negative relationship between digital human interaction and feelings of social isolation is considerably stronger for those in cities. For that matter, notice that the relationship for those in villages is basically flat; the 95 percent confidence interval around the slight negative slope indicates that the relationship could be flat.

The results from the interaction between online to offline relationships and urbanicity are displayed in the graph in the upper right hand corner of Figure 5. Again, here, the main

Table 2: Modeling Social Isolation

	(1)	(2)	(3)	(4)
Human Interaction	−0.14* (0.02)	−0.04 (0.04)	−0.14* (0.02)	−0.14* (0.02)
Online-Offline	0.07* (0.01)	0.07* (0.01)	0.15* (0.03)	0.07* (0.01)
Social Media	0.05* (0.03)	0.05* (0.02)	0.05* (0.02)	0.13* (0.05)
Urbanicity	−0.04* (0.01)	0.02 (0.03)	0.01 (0.02)	0.04 (0.05)
SES	−0.04 (0.03)	−0.04 (0.03)	−0.04 (0.03)	−0.04 (0.03)
Female	0.02* (0.01)	0.02* (0.01)	0.02* (0.01)	0.02* (0.01)
CCP Member	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Age	−0.19* (0.03)	−0.20* (0.03)	−0.20* (0.03)	−0.20* (0.03)
Human Interaction*Urbanicity		−0.14* (0.05)		
Online-Offline*Urbanicity			−0.12* (0.03)	
Social Media*Urbanicity				−0.13 (0.07)
N	2173	2173	2173	2173
R2	0.08	0.08	0.09	0.08

* p < 0.05

Note:

Estimates are derived using ordinary least squares

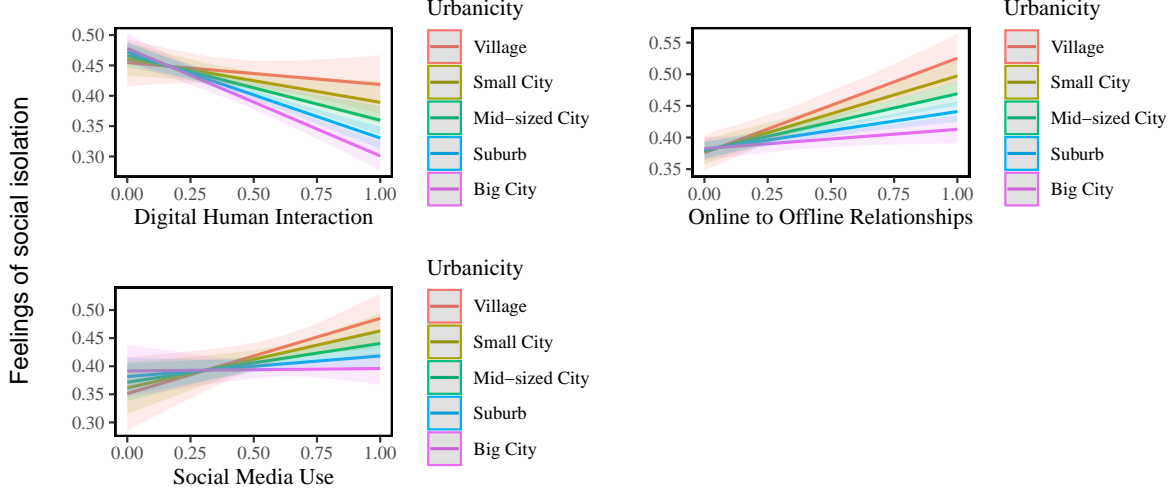


Figure 5: Modeling Social Isolation: Interaction Results

effects run in the opposite direction than those of digital human interaction. Those who are more likely to move relationships from online to offline tend to feel more isolated, and the interactive results presented here suggest that this relations is stronger for those living in less urban spaces. Likewise, the same is the case for those using social media more frequently. In fact, the relationship here for those living in the largest cities is completely non-existent.

In terms of our original hypotheses, we find support for the idea that China’s social media environment is not particularly unique with respect to generating feelings of social isolation (**H1b**). Whether or not this is due to the influencer culture or other factors, we cannot say with our data but it at least does suggest that greater content regulation is not likely to moderate the amount of isolation that social media produces. We also find, as has been found in other studies, that users who use the internet to create new connections are less likely to feel isolated (**H2**). However, this does not seem to extend to those that use the internet to facilitate offline meetups. Finally, we find that the impact of the internet and social media vary significantly according to the level of urbanicity (**H3**). These findings are generally in line with previous research on the subject, suggesting that the mechanisms that generate feelings of social isolation are universal and not so sensitive to different social and governing contexts.

Conclusion

Cyberoptimists heralded the internet as means by which people could connect, build social capital, and some suggested this could deter social isolationism. Our results provide little evidence of this optimistic view of the internet and its ability to improve the quality of people’s lives. We do find that some are more likely to interact with family and friends and that this does deter feelings of social isolation, but on the other hand, even though many move online

relationships offline and connect through social media, doing so does not deter feelings of social isolation. Instead, such digital activity is actually associated with increased feelings of social isolation.

We also found no evidence that the internet could serve as bridge to build connections for those living outside of cities. The optimistic view here would be that the internet could lower the costs of making connections for those who have less social opportunity, those living in less populated areas, and as a result, help them to feel less isolated. We, in fact, found the opposite. Internet communication had either less positive effect or more negative effect on feelings of social isolation for those living in less urban spaces.

Our contribution here is that we look at some well-established theoretical arguments in a context outside that of where most of the research centered on these type questions has examined. While our study is far from the last word on the subject, these results suggest that the mechanisms that link social media use and social isolation are relatively context-insensitive.

References

- Ademiluyi, Adesoji, Chuqin Li, and Albert Park. 2022. "Implications and Preventions of Cyberbullying and Social Exclusion in Social Media: Systematic Review." *JMIR Formative Research* 6 (1): e30286. <https://doi.org/10.2196/30286>.
- Alabri, Amna. 2022. "Fear of Missing Out (FOMO): The Effects of the Need to Belong, Perceived Centrality, and Fear of Social Exclusion." *Human Behavior and Emerging Technologies* 2022 (February): e4824256. <https://doi.org/10.1155/2022/4824256>.
- Appel, Markus, Caroline Marker, and Timo Gnambs. 2020. "Are Social Media Ruining Our Lives? A Review of Meta-Analytic Evidence." *Review of General Psychology* 24 (1): 60–74. <https://doi.org/10.1177/1089268019880891>.
- Beyens, Ine, J. Loes Pouwels, Irene I. van Driel, Loes Keijsers, and Patti M. Valkenburg. 2020. "The Effect of Social Media on Well-Being Differs from Adolescent to Adolescent." *Scientific Reports* 10 (1): 10763. <https://doi.org/10.1038/s41598-020-67727-7>.
- Büttner, Christiane M., and Selma C. Rudert. 2022. "Why Didn't You Tag Me?!: Social Exclusion from Instagram Posts Hurts, Especially Those with a High Need to Belong." *Computers in Human Behavior* 127 (February): 107062. <https://doi.org/10.1016/j.chb.2021.107062>.
- "China's Latest Social Media Trend: Diaosi / Loser Subculture." 2016. <https://www.appnova.com/chinas-latest-social-media-trend-diaosi-loser-subculture/>.
- Ellison, Nicole B., Charles Steinfield, and Cliff Lampe. 2007. "The Benefits of Facebook 'Friends': Social Capital and College Students' Use of Online Social Network Sites." *Journal of Computer-Mediated Communication* 12 (4): 1143–68. <https://doi.org/10.1111/j.1083-6101.2007.00367.x>.
- Hajek, André, and Hans-Helmut König. 2019. "The Association Between Use of Online Social Networks Sites and Perceived Social Isolation Among Individuals in the Second Half of Life:

- Results Based on a Nationally Representative Sample in Germany.” *BMC Public Health* 19 (1): 40. <https://doi.org/10.1186/s12889-018-6369-6>.
- Henning-Smith, C, A Ecklund, and K Kozhimannil. 2018. “RURAL-URBAN DIFFERENCES IN SOCIAL ISOLATION AND ITS RELATIONSHIP TO HEALTH.” *Innovation in Aging* 2 (Suppl 1): 770. <https://doi.org/10.1093/geroni/igy023.2851>.
- Kaye, Lenard W. 2017. “Older Adults, Rural Living, and the Escalating Risk of Social Isolation.” *Public Policy & Aging Report* 27 (4): 139–44. <https://doi.org/10.1093/ppar/prx029>.
- Kim, Harris Hyun-soo. 2017. “The Impact of Online Social Networking on Adolescent Psychological Well-Being (WB): A Population-Level Analysis of Korean School-Aged Children.” *International Journal of Adolescence and Youth* 22 (3): 364–76. <https://doi.org/10.1080/02673843.2016.1197135>.
- Koning, Jolanthe Louise De, Afroditi Stathi, and Suzanne Richards. 2017. “Predictors of Loneliness and Different Types of Social Isolation of Rural-Living Older Adults in the United Kingdom.” *Ageing & Society* 37 (10): 2012–43. <https://doi.org/10.1017/S0144686X16000696>.
- Larson, Lincoln R., Rachel Szczytko, Edmond P. Bowers, Lauren E. Stephens, Kathryn T. Stevenson, and Myron F. Floyd. 2018. “Outdoor Time, Screen Time, and Connection to Nature: Troubling Trends Among Rural Youth?” *Environment and Behavior*, October. <https://doi.org/10.1177/0013916518806686>.
- Li, Jie, and Nikolas Rose. 2017. “Urban Social Exclusion and Mental Health of China’s Rural-Urban Migrants – A Review and Call for Research.” *Health & Place* 48 (November): 20–30. <https://doi.org/10.1016/j.healthplace.2017.08.009>.
- Lim, Michelle H., Robert Eres, and Shradha Vasan. 2020. “Understanding Loneliness in the Twenty-First Century: An Update on Correlates, Risk Factors, and Potential Solutions.” *Social Psychiatry and Psychiatric Epidemiology* 55 (7): 793–810. <https://doi.org/10.1007/s00127-020-01889-7>.
- Liu, Cong, and Yi Liu. 2020. “Media Exposure and Anxiety During COVID-19: The Mediation Effect of Media Vicarious Traumatization.” *International Journal of Environmental Research and Public Health* 17 (13): 4720. <https://doi.org/10.3390/ijerph17134720>.
- Liu, Jinhe, and Le Yang. 2022. ““Dual-Track” Platform Governance on Content: A Comparative Study Between China and United States.” *Policy & Internet* 14 (2): 304–23. <https://doi.org/10.1002/poi3.307>.
- Nan, Wu. 2013. “China’s Underdog Youth Find Success in ‘Diaosi’ - or ‘Loser’ - Identity.” *South China Morning Post*, May. <https://www.scmp.com/news/china/article/1232976/chinas-underdog-youth-find-success-diaosi-or-loser-identity>.
- Nowland, Rebecca, Elizabeth A. Necka, and John T. Cacioppo. 2018. “Loneliness and Social Internet Use: Pathways to Reconnection in a Digital World?” *Perspectives on Psychological Science* 13 (1): 70–87. <https://doi.org/10.1177/1745691617713052>.
- Ostic, Dragana, Sikandar Ali Qalati, Belem Barbosa, Syed Mir Muhammad Shah, Esthela Galvan Vela, Ahmed Muhammad Herzallah, and Feng Liu. 2021. “Effects of Social Media Use on Psychological Well-Being: A Mediated Model.” *Frontiers in Psychology* 12. <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.678766>.

- Primack, Brian A., Ariel Shensa, Jaime E. Sidani, Erin O. Whaite, Liu yi Lin, Daniel Rosen, Jason B. Colditz, Ana Radovic, and Elizabeth Miller. 2017. "Social Media Use and Perceived Social Isolation Among Young Adults in the U.S." *American Journal of Preventive Medicine* 53 (1): 1–8. <https://doi.org/10.1016/j.amepre.2017.01.010>.
- Steinfeld, Charles, Nicole B. Ellison, and Cliff Lampe. 2008. "Social Capital, Self-Esteem, and Use of Online Social Network Sites: A Longitudinal Analysis." *Journal of Applied Developmental Psychology, Social Networking on the Internet*, 29 (6): 434–45. <https://doi.org/10.1016/j.appdev.2008.07.002>.
- Subrahmanyam, Kaveri, Stephanie M. Reich, Natalia Waechter, and Guadalupe Espinoza. 2008. "Online and Offline Social Networks: Use of Social Networking Sites by Emerging Adults." *Journal of Applied Developmental Psychology, Social Networking on the Internet*, 29 (6): 420–33. <https://doi.org/10.1016/j.appdev.2008.07.003>.
- Szablewicz, Marcella. 2014. "The 'Losers' of China's Internet: Memes as 'Structures of Feeling' for Disillusioned Young Netizens." *China Information* 28 (2): 259–75. <https://doi.org/10.1177/0920203X14531538>.
- Tam, Luisa. 2019. "The China Fame Factory Training Online Influencers to Sell." *South China Morning Post*, January. <https://www.scmp.com/lifestyle/entertainment/article/2183174/trust-me-you-need-how-chinas-live-streaming-kol-stars-are>.
- Twenge, Jean M. 2019. "More Time on Technology, Less Happiness? Associations Between Digital-Media Use and Psychological Well-Being." *Current Directions in Psychological Science* 28 (4): 372–79. <https://doi.org/10.1177/0963721419838244>.
- Twenge, Jean M., Jonathan Haidt, Andrew B. Blake, Cooper McAllister, Hannah Lemon, and Astrid Le Roy. 2021. "Worldwide Increases in Adolescent Loneliness." *Journal of Adolescence* 93 (December): 257–69. <https://doi.org/10.1016/j.adolescence.2021.06.006>.
- Twenge, Jean M., Zlatan Krizan, and Garrett Hisler. 2017. "Decreases in Self-Reported Sleep Duration Among U.S. Adolescents 2009–2015 and Association with New Media Screen Time." *Sleep Medicine* 39 (November): 47–53. <https://doi.org/10.1016/j.sleep.2017.08.013>.
- Valkenburg, Patti M., Adrian Meier, and Ine Beyens. 2022. "Social Media Use and Its Impact on Adolescent Mental Health: An Umbrella Review of the Evidence." *Current Opinion in Psychology* 44 (April): 58–68. <https://doi.org/10.1016/j.copsyc.2021.08.017>.
- Wang, Junfang. 2020. "Regulation of Digital Media Platforms: The Case of China." Foundation for Law, Justice, Society. <https://www.fljs.org/banning-regulating-tiktok-addressing-concerns-national-security-privacy-and-online-harms>.
- Wei, Aw Cheng. 2023. "'Wang Hong' Culture Booms in China as More Young People Dream of Becoming Influencers." *The Straits Times*, May. <https://www.straitstimes.com/asia/east-asia/wang-hong-culture-booms-in-china-as-more-young-people-dream-of-becoming-influencers>.
- Xia, Ma. 1995. "Changes in the Pattern of Migration in Urban China." In *Migration and Urbanization in China*, edited by Lincoln H. Day, Ma Xia, and Ma Xia. New York, NY: Routledge.

Online Appendix

Variable Operationalization

Residual Analysis