CPH TECH POLICY BRIEF #2

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URBAN-RURAL DIVIDE IN SMARTPHONE USAGE

By Anna Sapienza, Sune Lehmann, Laura Alessandretti

OVERVIEW

In the present CPH Tech Policy Brief, we investigate how exposure to certain contexts - in this case *urban* and *rural* environments - can influence the use of smartphones. We then relate our result to the broader research on smartphone overuse and digital addiction. This analysis is based on a world-wide sample of 500K anonymised users. Our key finding is that individuals living in rural environments use smartphones less than their urban counterparts, on average. However, our results indicate that individuals who live in the countryside tend to use the smartphone for activities that are associated with smartphone addiction, i.e. social media networking and gaming. These findings could be due to differences between people who chose to live in cities and in the countryside. But by studying people that move from cities to the countryside and vice versa we are able to show that the uncovered differences partly emerge because the place where people live directly affects smartphone use.

SMARTPHONES IN EVERYDAY LIFE

Smartphones have become an essential part of people's day-to-day life across the globe. Their deep integration into society makes smartphones increasingly necessary to carry out a wide range of ordinary activities, e.g., entertainment, shopping, information etc. Smartphones facilitate the access to services via dedicated apps and foster new forms of connectivity through social media. There are more than 3 billion smartphone users worldwide, and this number is steadily growing. More than a third of smartphone owners report that the phone is the first thing they reach for when they wake up in the morning, almost 50% report that they use their phones during the night and 81% of U.S. smartphone owners say that they keep their phone nearby during nearly all waking hours.[1][2] The average user has a screen time of 2 hours per day. However, screen time varies profoundly across users, from 10 minutes to more than 8 hours per day.

THE BENEFITS AND DRAWBACKS OF SMARTPHONE ENGAGEMENT

Our study does not quantify addiction but relates our results to the existing literature around digital addiction. In this literature, engaging with the smartphone has been found to have both positive and negative effects on individuals. On the one hand, smartphones can contribute to building a sense of belonging[3], reduce social isolation, and can have a positive impact on psychological health[4]. On the other hand, smartphone engagement can lead to pathological use and have negative outcomes on cognitive abilities, social interactions[5], mental and physical health[6]. Smartphone devices can be used in a compulsive manner, to the point that smartphone overuse has been proposed as a form of digital addiction[7]. However, not all users and digital activities are the same. Some individuals are more prone to become addicted than others, and research based on questionnaires, such as the Smartphone Addiction Inventory and the Smartphone Addiction Proneness Scale, showed that among the factors predictive of smartphone addiction, duration on social networking services and gaming were found to be the most important[8][9]. In order to create new policies and raise awareness about smartphones, it is then of critical importance to identify which factors might impact smartphone usage and create inequities across individuals.

DIFFERENCES IN ACCESS AND USE - THE URBAN-RURAL DIVIDE

Our current understanding of smartphone usage across socio-demographic groups is quite limited, also because data sources describing how people use their smartphones are hardly available to researchers. While existing research has largely focused on how individual socio-demographic attributes impact smartphone usage, environmental and geographical effects have remained unclear. Compared to individuals living in urban areas, do individuals living in isolated and rural areas with limited accessibility to services and the possibility to physically connect use smartphones in different ways? Based on small-scale studies, it is suggested that people living in less urbanized areas use technology and social media less than people living in urban areas[10], but these hypotheses have not been tested at scale.

RESEARCH DESIGN AND DATA

We run a comprehensive world-wide study to investigate 1) Differences in smartphone usage in rural and urban contexts, and 2) Whether exposure to different environments impacts smartphone usage. Our study is based on a large-scale dataset, collected via a tracking app, and containing information on mobile app usage from around 500K anonymised users worldwide. The data, collected by a global smartphone and electronics company over a period of 4 years (from 2015 to 2019), is combined with information about the users including gender, age and country of residence, to quantify the characteristic patterns of usage and their relations to distinct residential environments. We use the GHS Settlement Model Grid to distinguish between urban and rural areas. We note that our sample population
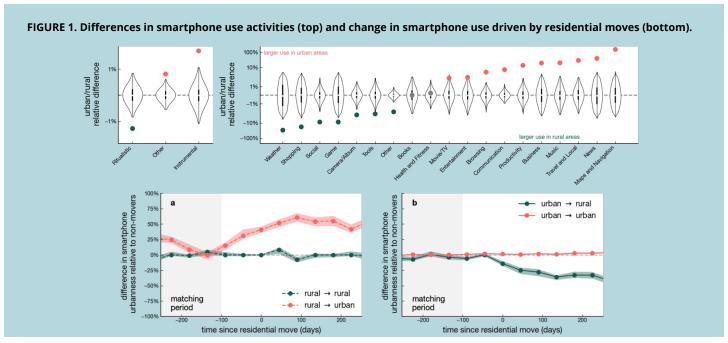
may not be representative of the wider population due to potential unobserved factors also associated with different phone ownership, level of education, and self-reported age and gender. However, many of our results are in line with existing literature on smartphone behaviors.

FINDING #1: DIFFERENCES IN SMARTPHONE USAGE IN RURAL AND URBAN CONTEXTS

We find that individuals that live in rural environments tend to spend less time on their phone compared to those who live in cities. This result is in line with previous smaller scale studies. We also highlight that people who live in rural areas tend to use their smartphones for diversion and "ritualistic" activities associated with problematic smartphone use, i.e. gaming and social media. Instead, individuals living in urban areas allocate more time to "instrumental" activities, such as navigation, news and travel (see the top panels of Figure 1). Importantly, with some exceptions, these results are generally consistent across groups with different age, gender, and country of residence.

FINDING #2: THE ENVIRONMENT REGULATES SMARTPHONE USAGE

Here, we study within-individual changes in smartphone activities for individuals who change their residential location to capture the role of the environment in regulating smartphone use. To this aim, we design an *urbanness index*, that measures the level at which specific smartphone activities are predominant in urban areas. Thus, the urbanness index roughly captures how much an

FIGURE 1. Differences in smartphone use activities (top) and change in smartphone use driven by residential moves (bottom).

individual uses apps that are more instrumental and goal oriented. We then study the evolution of the urbanness index for individuals who experience a residential move. We observe that after a residential move, the urbanness index for individuals moving from rural to urban areas changes dramatically, and vice versa for individuals moving from urban to rural areas (see the bottom panels of Figure 1). Our results demonstrate that exposure to urban and rural environments influences how individuals use their smartphones, e.g. what type of apps they use.

IMPLICATIONS

As this Brief shows, contrary to the common assumptions about the rural idyll, living out of cities carries inner costs on digital behaviors, with potential consequences for an individual's digital well-being. Individuals living outside of cities are more attracted to smartphone activities that can lead to problematic smartphone usage and make them more vulnerable to smartphone overuse. This carries implications for how we design and equally offer services to individuals, as environments that provide a multitude of stimuli can incentivize intentional digital consumption and limit engagement with social media and games.

This study also raises another key point: while behavioral incentives can have positive outcomes on individual actions, large tech companies deliberately design apps to retain users and motivate them to increasingly spend their time on their online services. It is then of crucial importance to design policies that can regulate mobile app companies, and raise awareness amongst the general public through campaigns and public information on the consequences that smartphone overuse has on vulnerable individuals.

Finally, we stress once more that high-resolution and longitudinal data sources describing how people use their smartphones are hardly available to researchers and policy makers. This limits our understanding of smartphone usage and of the consequences that individual and external factors have on our behaviors. The results shown in this Brief were only possible thanks to the availability of large-scale high quality data. Thus, we should strive to create and incentivize new collaboration between public and private institutions and companies to enhance data availability and transparency.

DILEMMAS

The present results raise a number of dilemmas, including:

> To what extent can we encourage the use of smartphones in rural areas to gain positive effects, such as a sense of belonging and reduced social isolation, while disincentivizing the overuse of potentially harmful apps?

> What explains why there seem to be both negative and positive mental effects of living in the countryside? In Denmark, for example, studies have shown that people experience a higher quality of life in the countryside. Can one imagine that both could be true? Or does it suggest that there is something in our notion of the rural versus urban that needs rethinking?

POLICY RECOMMENDATIONS

> Environments with limited access to stimuli enhance inequalities and can lead to negative outcomes in the use of digital devices. We need to design policies with the focus of enhancing the access to services to limit urban-rural inequities

> Increased awareness about smartphone use and in particular about gaming has been shown to be predictive of smartphone addiction. We need to increase awareness about the possible negative impacts of smartphone overuse amongst the general public through e.g. campaigns, public information and solid research

> Our study shows that patterns of smartphone-usage are more complex than what we assume, and that usage is shaped by the environment in unexpected ways. We need to fund more descriptive research to gain a better understanding of digital behaviors and incentivize collaborative efforts between tech companies and academic researchers.

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