

Small Circles: Mobile Telephony and the Cultivation of the Private Sphere

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This article examines how we use mobile telephony to maintain our physically and socially closest social circle. The analysis is based on traffic data gathered from Norway using approximately 24 million calls and texts made by private individuals. Previous research has shown that our temporal and spatial movement is highly predictable and that the majority of calls and text messages are sent to only four to six different persons. This article extends this research by examining both tie strength and the distance between the interlocutors in urban and rural settings. The findings show that even as information and communication technologies (ICTs) potentially put the world at our fingertips, the mobile phone is an instrument of a more limited geographical and social sphere. Approximately two-thirds of our calls/texts go to strong ties that are within a 25-km radius.

Keywords mobile communication, geographical diffusion of calls, close ties, Norway, rural/urban differences

There are clusters of technology—some new, some old—that are used in the maintenance of daily life, which is enmeshed in a variety of routines and rituals, what Burger and Kellner (1964) call the *nomos*. We use the mobile phone, along with transportation technologies, to

give structure to our daily lives. We use these to arrange shopping with our partner and to work out when and where we will meet a friend for a coffee. We might send a text to check up on a child; we might need a longer conversation to plan dinner, or to think through the best way to plan a birthday celebration for a good friend. We use it to find one another in the shopping center and to give others directions on how to get to the restaurant. Moreover, since social and geographical distances are deeply intertwined, we talk a lot to the people with whom we spend a lot of collocated time.

The closer we are—in a social sense—to another person, the more we expect of them. There are higher levels of trust and reciprocity and there is a web of mutual expectations for those in our intimate sphere (Haythornthwaite 2002; Parks and Roberts 1998). At the same time, emotional and geographical distances are interlaced. They both contribute to the idea that we should be available to one another. We expect our closest sphere of family and friends to be available in the case of emergencies (both large and small; Sundsøy et al. 2012), just as we expect them to be available to us in the flux of daily life (Licoppe 2004; Ling 2012). Given this relationship, is social closeness also reflected in physical propinquity, particularly when exposed to information and communication technologies—and specifically the mobile phone?

Previous work looking at mobile communication and social ties has often done one of two things. In the cases where the authors know the physical distance being called (Campbell and Kwak 2007; Traugott et al. 2006), they

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often do not have the advantage of being able to calculate the tie strength. Conversely, when tie strength is available, what has been lacking is a variable describing distances being called (Ling et al. 2012; Hohwald et al. 2010). In some cases, researchers have started to look at this issue from both perspectives (González et al. 2008; Sobolevsky et al. 2013). Joining that effort, this article brings these two dimensions together.

This analysis is based on call data records of a Norwegian telecommunications operator, Telenor (the larger of two main network operators in Norway, and that has about half of the existing subscriptions). We use approximately 24 million anonymized domestic calls and texts from call registers to the geographical diffusion of the interactions. Beyond simply looking at the geographical range of the calls, we examine the data, taking into consideration the different tie strengths between the interlocutors.

The rest of the article is organized as follows. We first consider the role of the mobile phone in the context of the intimate sphere and in the context of the geographically local area. Thereafter we discuss the methodology and data analysis. Finally, we look at the findings in the context of modern society and the way that we enact our social lives.

MOBILE PHONE AS A TOOL OF THE SOCIAL AND GEOGRAPHICAL SPHERES

The Social Sphere

The mobile phone is a device with which we maintain the intimate sphere (Ling 2008). Analysis has shown that we call and text a very limited number of other people. When thinking of the social circle with which we text and call, the number of persons with whom we are in regular contact is quite small. Half of our calls go to three or four people and half of our texts go to five or six people (Hampton and Ling 2013; Ling et al. 2012). When examining normal mobile voice calls, for every call we make to our 20th strongest tie, we make approximately 160 calls to our strongest tie.¹ Taking this line of analysis further, for every call to the 20th strongest tie we call our 5th strongest tie 26 times, our 10th strongest tie 7 times, and our 15th strongest tie 2 times. The analysis of call data records does not reveal the nature of the relationship between the individuals. However, in qualitative analysis of these call patterns it is noted that these strong ties are most often family and secondarily they are close friends (Boase and Kobayashi 2012; Hampton and Ling 2013; Ling et al. 2013).

We use the mobile phone to coordinate interaction and exchange phatic communications in the private sphere.² The mobile phone has grown to be a reliable way to contact our closest ties. We use it to contact our spouse to decide on what to have for dinner and we call a friend just to touch base. We receive calls from our children

when they need to be picked up after different activities and we text them when we wonder whether they will make it home for dinner. Thus, in many ways, the mobile phone has become a structured part of society (Ling 2012). The device has intertwined itself in our lives because it made us individually accessible and it has often replaced the landline telephone (Ling and Donner 2009). This is seen in the comments of an adult woman from Norway who said, "If I need to get in touch with my friend and I call home, I never catch her there. I always need to call her mobile. She always has that with her. If she does not take the call it is something exceptional." It is also seen in the comments of a teen, also a Norwegian, who said that she used the mobile phone to talk mostly "with three or four family members and friends and some people at school and things like that."³ These remarks indicate that the device is near at hand. It is seen as an open channel and it is used among those with whom we are socially close. There is clearly also a "long tail" of socially distant weaker ties. We might order pizza, make a doctor's appointment, or call a great aunt with whom we have occasional contact. However, as noted, the bulk of mobile communication is with a relatively small number of other individuals. Because we use it so intensely in our interactions with socially close individuals, the mobile phone is a medium through which we maintain and indeed strengthen these ties (Licoppe 2004).

A part of this is explained in that, unlike the use of net-based social networking sites, calling and texting cost money (however ill-defined the pricing is in our minds). While we are occasionally willing to call a distant relation, we are much more willing to use the mobile phone to keep in contact with our closest sphere of friends and family (Odlyzko 2000). With people we are socially close to, we tend to have common tasks that require coordination, which is facilitated by mobile phones. This allows us to keep open the lines of communication on an ad hoc basis (Licoppe 2004) and to update one another on daily developments (Ling and Yttri 2002). Because of this, the mobile phone is an instrument of the intimate sphere, where the intensity of this social interaction can result in the prioritizing of in-group ties at the expense of out-group interaction (Blau 1974; Ling 2008).

THE GEOGRAPHICALLY LOCAL SPHERE?

The intimate sphere lives on copresent interaction (Collins 2004). Claude Fischer (1982) finds that we are more likely to carry out various activities with people who are physically close. It is in this sphere that we carry out social activities, chat about hobbies, and discuss personal matters. Research has shown that close emotional and geographical distances are compounding (Ellegård and Vilhelmson 2004; Fischer 1982; Gans 1967; Hågerstrand 1966;

Hampton 1998; Wellman and Wortley 1989). We need the chance to share a joke or to have a serious talk. We need to see how their latest haircut looks or how that new sweater they just bought really fits. We have to groom and care for one another. While some of this can be done via calls and other mediated interaction, it is best done face-to-face. We seemingly need to have the chance to see and to be in close contact with our nearest friends and family.

The work by Tillema et al. (2010) suggests that as relational distance increases there is an increasing reliance on asynchronous communication. Similarly, Mok and Wellman (2007) found that as distance increased there was a reduction in social contact, with a marked decrease when the contacts were more than 50 miles away and with another inflection at 100 miles (Mok and Wellman 2007).⁴ While not considering the social dimension of interaction, examination of large mobile-based data sets shows that there is a massive regularity in our behavior and in our interactions. According to González, Hidalgo, and Barabási (2008), who drew on the movement patterns of 100,000 anonymized mobile phone users over a 6-month period, there is a high degree of temporal and spatial regularity in our movements. Similarly, Calabrese et al. (2011) show that 90 percent of the people who have called one another, regardless of tie strength, have been within the range of the same cell tower (see also Hidalgo and Rodriguez-Sickert 2008; Igarashi et al. 2005). Within this localized sphere of interaction, there is an interaction between the mobile phone and automobile-based transportation.

Previous to the rise of the car, there was largely need for only local transportation and local communication. Sociation was constrained to those who were within a short distance that could usually be covered by walking. In the pre-car era people rarely traveled more than one mile to work and society was organized around local shopping, work, schooling, and so on (Jackson 1985, 15; Elliott and Urry 2010). This meant that coordination was done by word of mouth (Lynd and Lynd 1929; Moline 1971). There was only rarely the need to for long-distance messaging, particularly among those people whose affairs were almost exclusively local.

The development of commuter trains and then the post-World War II spread of automobile-based transportation in urban and suburban settings greatly expanded the radius of our action and changed the way we socialize, shop, and work (Flink 2001). In the words of Urry (2007), the automobile unbundled “territorialities of home, work, business and leisure that were historically closely integrated” (120). Cities and their suburban fringes were extended across the landscape. The landline telephone system was an important element in this development. According to Gottman (1977), “There can be no doubt, however, that modern telephone systems, with their use of wires and waves, switchboards and computers, cables and satellites

have made the space they serve more fungible for communication purposes. It became possible, in principle, for individuals located anywhere in that space to converse with one another” (307). He continues, “The generalization of the individual motorcar and of the telephone have actively aided suburban sprawl” (312).

The mobile phone adds a new twist to this since it makes us individually available to one another regardless of where we happen to be. This immediate availability to one another allows us to coordinate our interactions in this broader geographical landscape. We can adjust and change our meetings and interactions as need and exigencies arise (Ling and Yttri 2002). This means that we can more easily organize the complex logistics associated with work, leisure, shopping, schooling, and social interactions, where work may be in one direction, shopping in another, the appointment with a hair dresser in a third, and the parent–teacher meeting in yet a fourth direction. It makes it easier to inform our closest ties (read: partner) of our daily comings and goings and of the gyrations of our children (Ling and Yttri 2002). The need to coordinate interaction with members of our closest sphere is a central issue for many people and has been made more complex by urbanization. In addition, we have seen a massive shift in the situation of women as they have entered the labor market. This, in turn, has also stimulated a need for better communication and coordination practices (Frissen 2000) as, for example, children are being chauffeured between various school and free-time activities. In one of the few studies that compares the mobile and the landline phone, Hohwald et al. (2010) find that the mobile phone is used more sparingly and for a smaller circle of interlocutors than is the landline. In this comparison there is a problem in that the unit of analysis is different for mobile and landline telephony—individual in the case of the former and the household in the case of the latter. With this caveat, they find that there are more calls, the calls are temporally longer, and the circle of interlocutors is somewhat larger for the landline phone than for the mobile phone. One would, however, expect these results if the landline phone is being used by a broader group of individuals when compared with the mobile phone.

The mobile phone needs to be seen in the light of proximate social interaction. The Pohn/Michigan study gathered self-report data on how many of the last 10 calls had gone to interlocutors (1) within 10 miles, (2) between 10 and 25 miles, (3) beyond 25 miles but within the United States, and (4) outside the United States. These data show that people had, to some degree, a preference for calling local interlocutors; for example, 60 percent of the respondents called only to others who were within 5 miles (8 km) (Traugott et al. 2006). Based on these data, Campbell and Kwak (2010) report that texting and mobile voice interaction support local sociation. They note that the mobile

phone supports the individual's participation in local clubs and organizations, as well as interaction with family and friends. But these data do not allow for the researchers to ask about tie strength as related to distance.

The work of Rivère and Licoppe (2005) shows that the mobile phone and texting has a central role in maintaining "intimate bonds." This general finding is also seen in Tillema, Dijst, and Schwanen (2010), who note that as distance increases, the strength of ties loosens. In their study of Dutch social interaction, distance also has an impact on face-to-face interactions. They note that "distance decay" is a factor in social relations. However, this was stronger in the case of relatives than with friends. They suggest that as people are further away from their contacts, they are increasingly "out of sight, out of mind."

METHOD

In order to better understand the distance-based use of the mobile phone, we were able to extract an anonymous sample⁵ of anonymous log data for approximately 24 million anonymous calls and texts made by private subscribers in Norway in the second quarter of 2011. We used the anonymized residential postal number of the individual calls to measure the distance between interlocutors. As noted, we use log data, which have been shown to have higher validity when compared to self-report data (Abeele et al. 2013; Boase and Ling 2013; Kobayashi and Boase 2012). Another advantage of log data that is not available with more limited self-report material is that it allows us to calculate a global view of the users' network connections (albeit an anonymous one since there is not a link to the identity of the users). Using these data we have calculated the tie strength. In this case, tie strength is defined by the number that a person called most often, second most often, and so on during the previous 3-month period.

The postal code is obviously a proxy for the more exact location of the actual mobile phones when calls are being made and texts are being sent. It is suggested that use, for example, of cell-tower addresses would provide more insight into the mobility of individuals. This is true. However, we lack the ability to gather this information in this database; privacy considerations dictate that we use the postal code. To be sure, the postal codes are not a standard unit. Those in the city can be for a small area while rural postal codes can be for a large one.⁶ This certainly colors the analysis. However, the number of people in a Norwegian postal code is relatively small. Each postal code has approximately 1,000 persons, which is much smaller than the comparable ZIP code in the United States that has about 25,000 persons (Phan 2013). Further, the majority of calls are placed from the "home" postal code of the individual (Ling and Engø-Monsen 2013). The approxi-

mation provided by the use of postal codes is problematic, but it nonetheless provides insight into the way that the devices are used in daily life, particularly when seen in the light of tie strength.

The location of the postal code was converted to global positioning system (GPS) coordinates using a script that did a lookup of post codes. For each call or text, distance between interlocutors was then calculated, using Oracle pl-SQL, from GPS coordinates and translated into kilometers using the spherical law of cosines. The median values were used in the analysis to reduce the effect of extreme cases. We have used a symmetric version of the call network, that is, the direction of the traffic is not considered. Further there is no analysis of "off-net" customers (i.e., interlocutors who were not Telenor subscribers). That is, only communication between Telenor private customers is used.

In some situations, international calls or calls across international boundaries can play out in a focus on local calls (Ben Harush 2011). It is important to note, however, that the data included in the analysis do not include international calls since the cell location of the international person is not known. Thus, we do not have the ability to determine their location. This means that we cannot examine the effect of international pricing, time zones, and so on in the context of this article. Further, there is a flat rate structure for calls within Norway. This would mean that there are no price differences for people calling within the country. In other words, there is not an economic barrier associated with calling a person who is nearby or who is far distant.⁷

We calculated the tie strength for the individuals involved in the different call/text interactions. This way of calculating tie strength is common in the literature on mobile communication and social network analysis (Eagle et al. 2009; Onnela et al. 2007). The tie strength between the individuals was based on the number of calls and texts (i.e., the sum of the volumes) between two numbers over the previous 3 months. The "other" number that was called and texted the most is the strongest tie. The second most called/texted number is tie number two, and so on. We have developed filters and filtering techniques with which to eliminate calls and texts that are machine generated. We have also excluded commercial subscriptions.

FINDINGS

The data show that the mobile phone is used for interaction in a relatively small physical world. The absolute distance of the links, that is, calls or texts, is shown in Figure 2. These data show that the most frequent distance is zero: that is, two people who have the same post code are calling or texting one another the most. The maximal distance was 1767 km. It is interesting to note that the maximum

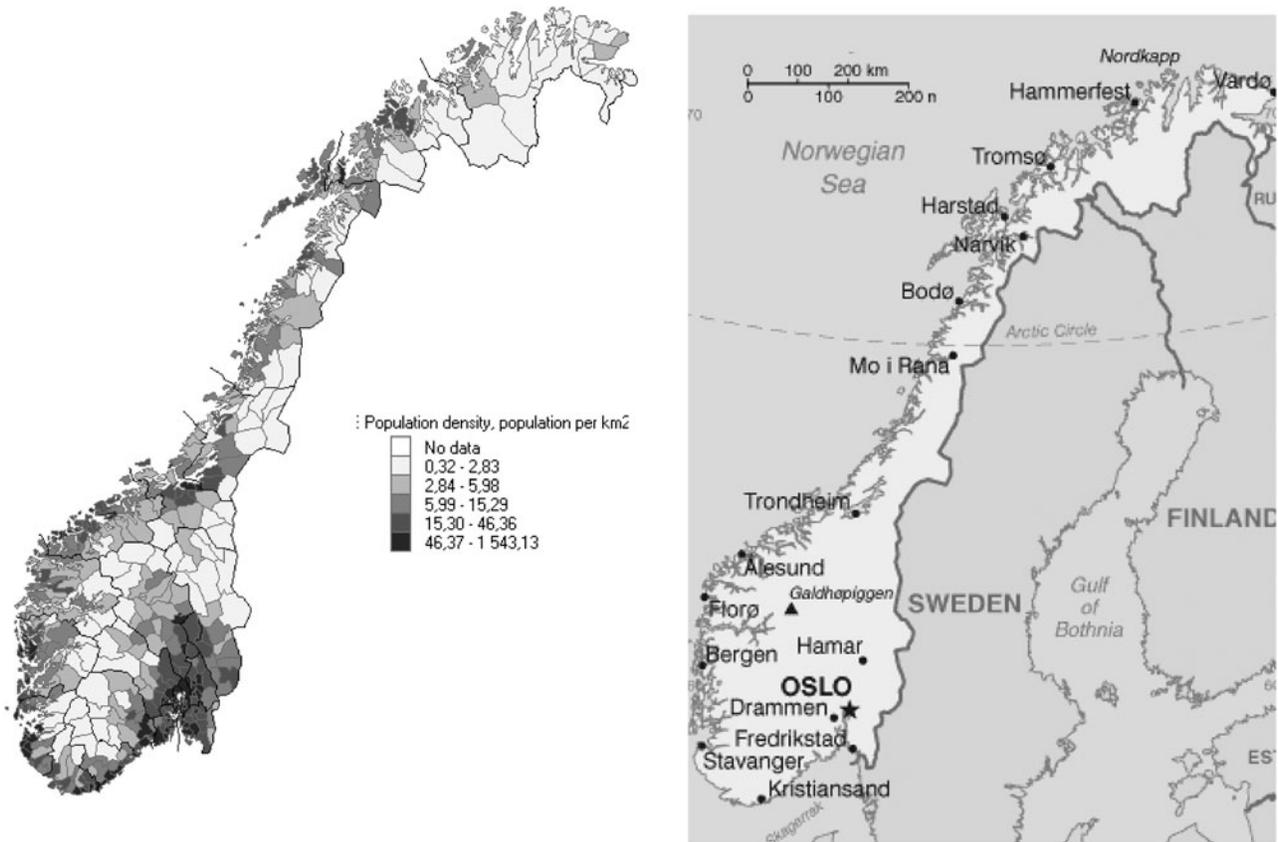


FIG. 1. Population density and major cities of Norway. Source: Statistics Norway (<http://www.ssb.no>).

distance in Norway, that is, the distance between Lindesnes and Vardø, is 1777 (see Figure 1).

To put the data in Figure 2 into perspective, 20.1 percent of all links were in the same postal code and 42 percent were in zones within 10 km. Further, 23.9 percent of all calls/texts were from zones more than 100 km away with a

small peak at about 300 km, the distance between several of the largest cities in Norway. The data also show that 1.8 percent were between people who live more than 1000 km apart. The material in Figure 2 does not examine the data by the strength of the link. This analysis is presented in the following.

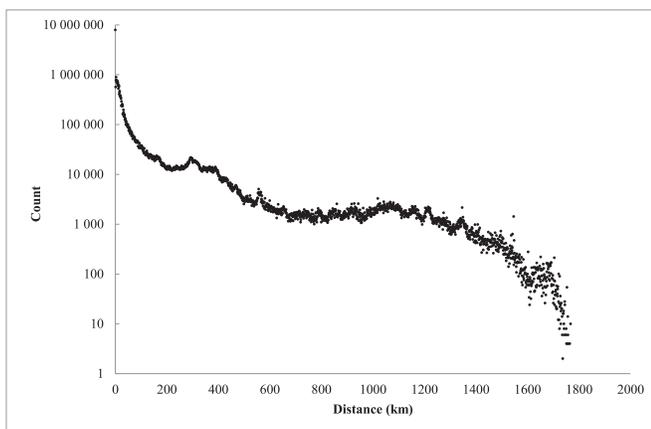


FIG. 2. Absolute distance for all links in kilometers. (Note: Count is represented in a logarithmic scale.)

Figure 3 shows the median distance between links of different rank for people living in cities, towns and in the countryside.⁸ Slope of the curves shows that the strongest links are generally the closest in terms of distance between the interlocutors. The ties with the highest strength are between 8 and 10 km distant, with the people living in towns showing somewhat shorter distance for the strongest ties. The curves show a general upward direction at least for the first 10 ties. The median distance between the first 30 links is within a relative local distance that is generally less than 20 km. That is, it would take approximately 20 minutes to drive this distance if there were no traffic. In 2009 the average distance for a personal trip was approximately 12 km for all Norwegians regardless of where they lived and 14.72 km for people living in rural areas (Brechan and Vågane 2012). People who worked in Oslo or Bergen (the two largest cities) but who lived in a nearby suburban location commuted the farthest. The commutes

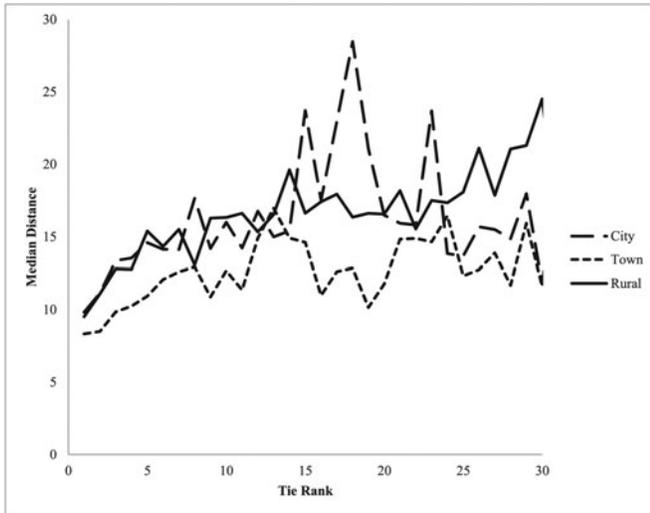


FIG. 3. Median distance between links by link rank for people living in different situations.

were 18.3 and 14.0 km, respectively (Vågane et al. 2011). Aside from these two groups, the commuters were shorter (from 7.9 to 11.1 km) for all Norwegians, including those who live in the cities and who live in the small towns or the countryside.⁹

It is also worth noting when viewing Figure 3 that we are in contact with only the first handful of ties on a regular basis. It is relatively rare that we call those who are more socially remote. Thus, the more remote the ties, the less often we are in touch.

Another way to look at the material was to consider the percent of links that communicated over different social distances. The data in Figure 4 show the percent of a particular link strength that was, for example, less than 1 km apart (noted as “walking” distance), 1 to 24 km apart (“car

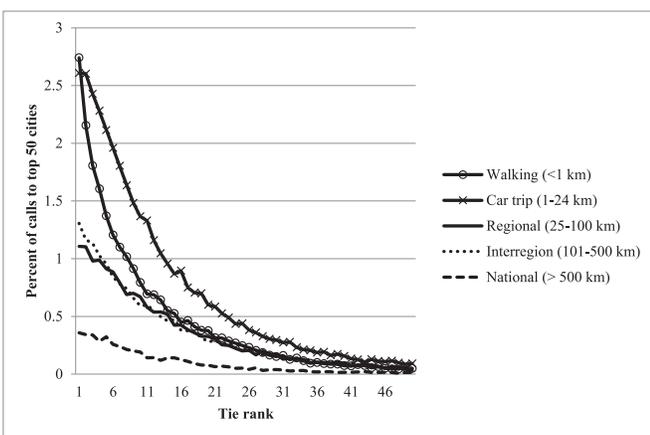


FIG. 4. Percent of calls to top 30 links by distance of the interlocutor.

trip” distance), and so on. This analysis is applied only to the people calling or texting from the cities. About 3 percent of the traffic included in this analysis was to the strongest ties that were within walking distance. Another 3 percent went to the strongest tie that was within convenient driving distance. If we sum the top five ties for the “walking” (<1 km) and “driving” (1–24 km) distances, this encompasses about 25 percent of the calls/texts. The analysis shows that there are many links that are in the immediate neighborhood that is within the same postal code. There are also a good number of links that are within what we might consider convenient automobile distance. Indeed, the research shows that 86 percent of trips in Norway were less than 20 km in 2001 (Denstadli and Hjorthol 2002). This resonates with the data shown here, namely, that beyond 25 km there are fewer calls and texts. All told, almost two-thirds of all calls/texts go to the people (regardless of link strength) living within what we call the city distance. A further 16 percent go to people in the regional range and the remaining go to further distances. In summary, then, Figure 3 here shows that as link strength declines, there is generally greater geographical distance between the interlocutors.⁹

Pushing the analysis somewhat further, we have divided the data into “urban,” “small town,” and “rural” groups. Looking at the top 50 ties for these three groups shows that urban and small-town residents have fewer calls/texts that are within “walking distance,” that is, less than 1 km (Figure 5). The data show that about one in six calls made by urban dwellers were at this distance. By contrast, rural residents (who make up about 20 percent of the population) had about one in three calls that were within walking distance. The urban and small-town residents were more active when looking at the “car distance” (i.e., 1 to 24 km). The remaining categories receive relatively little traffic. The one exception is that city residents make a

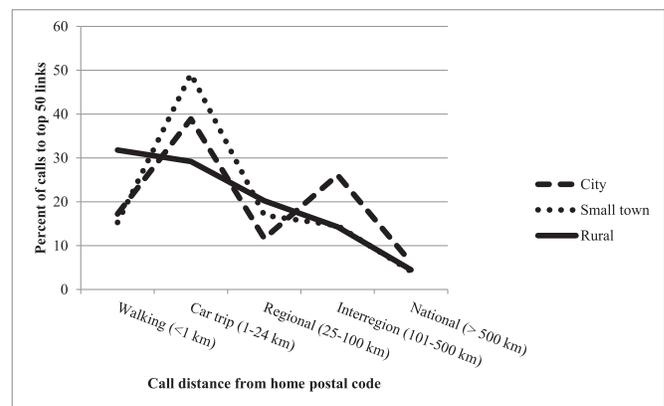


FIG. 5. Percent of calls from top 50 ties for different distances by urban/small town/rural residence.

larger number of interregional calls. As noted earlier, this would account for the calls between the major cities. The general image that emerges from these data is that the rural residents (who are quite often farmers) are more local in their calling/texting than the other two groups. Further, the urban and small-town residents seem to make calls that are more distant, but within what might be considered commuting range. Indeed, as noted earlier, this is within the commuting range of many residents.

DISCUSSION

Extending previous research to mobile phones (Boase and Kobayashi 2012; Campbell and Kwak 2007; Hampton and Ling 2013; Traugott et al. 2006), the analysis presented here shows that physical distance and tie strength matter in relation to telephonic links. We not only call locally, but we call locally to our strongest ties. In effect, the mobile phone, along with different transportation technologies, is used in the maintenance of everyday routines with a relatively limited number of people in a relatively limited physical sphere of action.

This finding contradicts the notion that new digital communication eliminates the friction of distance. The data show that friction is still very much there. This is in spite of the fact that tariffs for mobile phone use have dropped dramatically in Norway since 2009 (Post-og teletilsynet [PT] 2013). In addition, the countrywide subscriptions for mobile telephony mean that there is no difference, at least in terms of price, when calling someone who is standing nearby or someone in a distant part of the same country. Yet the analysis presented here shows that calling is largely local.

The vast majority of people travel in small circles, both socially and geographically, when it comes to mobile phone voice and texting partners. While there is the possibility to call people at the far corners of the world, our horizons are often more limited. The preponderance of the calls/texts made by Norwegians, and in particular those who are living in cities and small towns, are to people who are only moderately distant, that is, within 25 km. The stronger is our tie to these people, the closer they are likely to be geographically. When speculating as to why this might be, the structure of our automobile-based lives, the movement of women into the workforce, and the increasingly automobile-based activities of children are all a part of the answer. That means we coordinate our interactions with a limited number of others as we go about our daily tasks. Taking this somewhat further, it is also interesting to consider how the mobile phone is becoming a key to the way that we organize our everyday tasks.

As noted earlier, the mobile phone's adoption was at least partially driven by the need to facilitate interaction in urban/suburban geographical settings that have been

extended by the automobile and automobile-based transportation. One can argue that the mobile phone would benefit people in rural areas since it would give them access to a wider net of more geographically distant people. By contrast, people living urban settings have their social world near at hand and thus their calls would be more local.

The data presented in Figure 5 put a somewhat different light on this. Here we see that the percent of the top 50 ties for the rural individuals decreases monotonically as the distance increases. That is, the largest proportion of calls is to those who are less than 1 km away. The situation of those living in more urban settings is different. There are relatively few calls made to people who are immediately nearby (within 1 km). Rather, the preponderance of calls goes to people who are more than 1, but less than 24, km distant. That is, the calls are to people who live within a radius that can be covered by a short 30-minute trip in a car (barring, of course, traffic jams and the like).

Playing on the felicitous phrase of Wei and Lo (2006), the mobile phone allows people to maintain their "psychological neighborhoods." In other words, the mobile phone allows us to maintain a social proximity when there is not the opportunity to maintain physical proximity. One might suggest that this operates equally well for rural as well as urban dwellers. However, as noted by Mok and Wellman (2007), there are different dynamics associated with the logistics of living in a city. Their size and diffusion have had consequences for the structuring of social and work related interaction. According to Urry (2007), we are left to "assemble complex, fragile and contingent patterns of social life" (122). People must disproportionately use automobiles to facilitate their working lives in this broader geography (Allard et al. 2003; Ehrenreich 2008; Hjorthol 2000). At the social level, urban dwellers often seek out major portions of our social interaction with people outside of their immediate neighborhoods (Fischer 1982; Flink 2001). As shown in Figure 5, the mobile phone's functionality as a logistical/social tool is reflected in these considerations. Namely, a larger percent of calls for nonrural residents goes to those ties that are beyond walking distance but within a town-/city-sized expanse.

In sum, the dream of virtual relationships carried on over long distance, while perhaps realized in other forms of mediation, is mostly only a dream when thinking of mobile interpersonal communication. Our social interaction with our nearest sphere of friends and family is also physically near. It has a large component of co-presence in the mix. To be sure, mediated (and mobile phone-based) interaction can play an important part in our intimate social interactions, but in the vast majority of cases, co-present interaction is foundational (Collins 2004).

The mobile phone allows us to touch base with others and to make plans as to how diverse and moderately distant

activities are to be coordinated (Ling and Yttri 2002). We use the phone to talk to our partner to adjust the time for our haircut or to deal with an issue at work while we wait to speak with our child's teacher, after which we will go buy food for dinner. Thus, rather than the more geographically bounded situation of the pre-automobile world and the fixed locations of the landline world, we use the mobile phone to manage local tasks with our closest ties. The mobile phone provides immediacy and flexibility in this complex of interactions. According to Urry (2007), "It is difficult to escape these systems given the significance of communications for the coordination of a flexible social life including visits with significant others. Human agency and social networks are thus complexly interwoven with mobile phones, email and the means of corporeal movement" (176). The nuanced interaction provided by the mobile phone is a perfect solution for coordinating activities within this intimate social sphere as we move across city-sized, automobile-only expanses. The mobile phone is a useful tool in the management of our daily interactions, and because of this, as shown in the data here, it is being structured into our interactions (Ling 2012).

Looking forward, we know that the nature of mobile technology will change. We have examined the role of interpersonal interaction via mobile voices and texting. Smart phones and the mobile Internet are also becoming a part of our "mobile" lives. These developments mean that we have a variety of other mediated information available to us via these devices. Social networking is increasingly taking up a part of the work that, until now, has been done via short message service (SMS) and mobile voice calls (Bertel 2013). Location-based applications and access to online scheduling information can eventually play into how we move through the geographies of our lives and how we rely—or do not rely—on friends and family (Sutko and de Souza e Silva 2011). Further, as we also begin to realize elements associated with the so-called Internet of things (Kortuem et al. 2010), the dynamics of interpersonal social interaction will also be effected. These considerations may play into the way that we use mobile communication to organize our lives. However, we suspect that simple co-presence will continue to play a major factor in relation to with whom and how we use mobile-mediated communication.

The growth of mobile communication and the mobile Internet also becomes more relevant as the older, copper-based, landline networks begin to be retired in favor of mobile solutions. Indeed, as the landline telephone fades from the picture there are policy-related questions with regard universal service and access to various telephonic services. Landline systems are increasingly difficult to provide, particularly relevant in rural areas where it is expensive and labor-intensive to maintain the copper-based system. This is also the case when landline systems suffer

from their exposure to natural disasters such as Hurricane Sandy.¹⁰ In cases such as this, it is difficult for operators to repair the system and in some cases to even find the parts and resources needed. There is, however, the undeniable need for telephonic contact and the policies to ensure that.

As with any study, there are limitations associated with this one. First, as noted earlier, the use of the postal code to determine the distance between links is not as precise as one might wish. Here the post-code distance serves as a proxy for the more exact distance of the call or text. As we noted earlier, the relatively small population for each postal code and the fact that the preponderance of calls/texts are made from this "home" zone ameliorate, but by no means eliminate, this concern. Second, it is not possible to examine either the content of the calls/texts or the motivation of the caller in making the calls. The data only describe the existence of a communication between nodes. Third, Internet Protocol (IP) forms of interaction such as Skype and Whatsapp are not included in this analysis. At the time of this data extraction, they were not prominent. Indeed, texting and calling are even now the dominant forms of mobile interaction. It is clear that IP forms of forms of interaction are making inroads into this dominance and this is worth future analysis. Fourth, the data come from Norway, which is a small, affluent, and somewhat unique country. There is nearly universal mobile phone ownership among the population in Norway. Finally, the sample here is not a sample from all Norwegians, but rather it is a sample from the Telenor network that includes about 60 percent of all subscriptions in the country. As this is the former incumbent operator, the users are somewhat older than the population as a whole.

NOTES

1. The data for this analysis include the call data records for a sample of subscribers to the Telenor system as of the second quarter of 2011. In this analysis, tie strength is defined as the person to whom we called the most during that 3-month period. According to the latest reports from Post-og Teletilsynet (the Norwegian Regulator), Telenor has a 49.7 percent share of the Norwegian Mobile market (PT 2013).

2. In this article, we use the terms intimate and private sphere somewhat interchangeably to denote the closest ties measured in terms of the volume of mobile communication. The data and the privacy laws governing its use do not allow us to know the specific relationship between the interaction partners. Thus, we are left to assume that the intimate sphere and the private sphere have a large degree of overlap.

3. These comments and the other citations come from a series of focus groups in Norway sponsored by Telenor. The results are unpublished.

4. The pattern is not the same for telephonic interaction. Rather, the decline took place at about 100 miles. Mok and Wellman (2007) concluded that the effect of distance was not as pronounced for

telephonic interactions. While it is not specified, the use of telephone in this study was most likely landline based. There was, for example, no discussion of texting that Licoppe (2004) has found so important in his discussions of connected presence. There is, however, the suggestion that location matters in the use of the mobile phone.

5. It is important to note that it is not possible to trace the name or other identity of any of the callers nor is it possible to access the content of the calls or the texts.

6. There was a tendency toward more use of the mobile phone in urban settings at the time of data collection. Analysis shows that 80 percent of the people in urban settings reported having a mobile call on a daily basis, where only 74 percent of the people living in the countryside (not in a village) reported the same. Further, 76 percent of the people living in towns with less than 20,000 reported calling. In relation to SMS, 70 percent of the urban dwellers versus 64 percent of the people in the country side reported sending a text message and 22 percent versus 9 percent reported using their mobiles for sending/receiving email (Vaage 2012).

7. There are some subscription types that would favor “friends and family” with lower rates. However, the general decline in the cost of calling/texting minimizes the economic effect of these (PT 2012). Further, there is no “friction of time zones” in the case of domestic Norwegian calls. This may be an issue for countries such as the United States where there are multiple time zones.

8. The cities are the five largest cities in Norway, including Oslo, Bergen, Trondheim, Stavanger, and Bærum. The small towns are the rest of the urban settings. The cities have 25 percent of the population, the towns have 53 percent of the population, and the rural areas have the remaining 22 percent.

9. In addition to the distance-based material, we were able to look into the gender-based calling distances. We found that in general the geographical circle of women is smaller than that of men. The median distance of calls was about 11 km for calls between women and 15.7 km for calls between men. This reflects the findings of Hjorthol (2000), who noted that women generally operate in a space closer to home and men often work further away.

10. <http://money.cnn.com/2013/07/22/technology/verizon-wireless-sandy/index.html>

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