

# Small circles: Mobile telephony and the cultivation of the private

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## Abstract

We examine how we use mobile telephony to cultivate and maintain our closest circle of friends and family. The analysis draws on actual traffic data gathered from a Nordic telecomm operator. The analysis was done in Sandinavia using approximately 24 million calls and texts made by private individuals to examine the geographical diffusion of the calls. 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 4 – 6 different persons. Thus, even as ICTs potentially put the world at our fingertips, the mobile phone is an instrument of a more limited geographical and social sphere. The material here shows that as much as two thirds of our strongest links are within a 25 km radius.

## Key words

Mobile communication, geographical diffusion of calls, close ties

## Biographical statements

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Ling is a professor at the IT University of Copenhagen, an ongoing cooperation with the research arm of Telenor and an adjunct position at the University of Michigan. Ling has a PhD from the University of Colorado (sociology). He has studied the social consequences of mobile communication for two decades. He has written several books in this area including *The mobile connection* (Morgan Kaufmann, 2004), *New Tech, New Ties* (MIT Press, 2008) and most recently *Taken for grantedness* (MIT Press, 2012). He is also a founding co-editor of the Sage Journal *Mobile media and communication*.

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Campbell's research examines the social implications of new media, with an emphasis on mobile telephony. Current projects investigate how mobile communication patterns are linked to both the private and public spheres of social life, such as social networking and civic engagement. Several of these projects use a comparative approach to situate the role of mobile communication technology in the larger media landscape and across different societies.

# Small circles: Mobile telephony and the cultivation of the private

## Introduction

The mobile phone is a tool that we use in our private interactions. It is used to coordinate our daily comings and goings. It helps us through our daily round of errands and tasks and we use it to chat with our friends and family. We use it to organize our lives and we also use it to cheer up a friend or to spread the news about a happy event. This often means that it is also a tool of geographical local interaction.

This is counterpoised with the idea that mediated communication gives us the chance to interact with others both near and far (Elliott and Urry, 2010). Cairncross describes the “death of distance” (1997). Others have noted community without propinquity (Calhoun, 1998) and glocalization, i.e. the idea that information and communication technologies (ICTs) allow us to interact with others regardless of their geographic location. However, social and geographical distances are deeply intertwined. We talk a lot to the people with whom we spend a lot of collocated time. However, ICTs, including mobile communication potentially allow us to talk with others from the far corners of the world. Thus, there is a contradiction. On the one hand, there is a line of narration that describes the death of distance that is often associated with the internet. This would suggest our social sphere is expanding geographically. Simultaneously, there are the findings that our interactions with people who are socially close are also more geographically local. This dimension is often the focus of mobile communication and specifically the use of voice and texting. Because of this, we arrive at the question as to whether our mediated contacts, and in particular those mediated through the mobile phone, are geographically close or distant.

The closer we are -- in a social sense -- to another person, the more we expect of them. There are higher levels of trust, 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) (P. R. Sundsøy et al., 2012) just as we expect them to be available to us in the flux of daily life (Christian Licoppe, 2004; Ling, 2012). Given this relationship, is social closeness also reflected in physical propinquity, particularly when exposed to ICTs – and specifically the mobile phone – that supposedly erase the friction of distance?

In this paper, we are interested in examining the geographical dimension of mobile communication. The material comes from the call data records of a Norwegian telecommunications operator Telenor. We use approximately 24 million calls and texts from call registers to the geographical diffusion of the interactions. Beyond simply looking at the geographical diffusion of the calls, we will examine the material using the different tie strengths between the interlocutors. We will first consider the role of the mobile phone in the context of the intimate sphere and in the context of the geographically local area. This will be followed by a discussion of the methods and the data and an analysis of the material. Finally, we will look at this 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 3 or 4 people and half of our texts go to 5 or 6 (Keith Hampton and Ling, in press; Ling et al., 2012). When examining normal mobile voice calls, for every call we make to our 20<sup>th</sup> strongest tie, we make approximately 160 calls to our strongest tie.<sup>i</sup> Taking this line of analysis further, for every call to the 20<sup>th</sup> strongest tie we call our 5<sup>th</sup> strongest tie 26 times, our 10<sup>th</sup> strongest tie 7 times and our 15<sup>th</sup> 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 (Hampton and Ling in press; Ling et al. 2013; Boase and Kobayashi 2012).

We use the mobile phone to coordinate interaction and exchange phatic communications in the private sphere.<sup>ii</sup> 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 bases. We receive calls from our children when they need to be picked up after different activities and we text them when we wonder if they will make it home for dinner. Thus, in many ways, the mobile phone has become a taken for granted element in daily life (Ling, 2012). The device has intertwined itself in our lives because it made us individually accessible and it has, in many ways, 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.”<sup>iii</sup> 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 to 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 (Christian 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 (Oldyzko, 2000). Another part of the focus on those with whom we are socially close is that we simply have common tasks and operate in a common social sphere. The coordination of this requires that we are available to one another. The mobile phone is an important channel for this type of communication since it gives us immediate access to one another. It allows us to keep open the lines of communication on an ad hoc basis (Christian Licoppe, 2004). We can update one another on daily developments and we can coordinate interactions (Ling and Yttri, 2002). Unlike the landline telephone we use the mobile phone to call to individuals and not to locations in the hope that our intended interlocutor

will be there (Ling and Donner, 2009). Because of this, it is an instrument of the intimate sphere, particularly when thinking about mobile voice communication and texting. It is indeed possible to question whether the intensity of this social interaction results in the prioritizing of in-group ties at the expense of out-group interaction in smaller bounded groups (Blau, 1974; Ling, 2008).

### **The geographically local sphere?**

The intimate sphere lives on copresent interaction (Collins, 2004). Claude Fischer finds that we are more likely to carry out a variety of activities with people who are physically close (1982). 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; Hägerstrand, 1966; K. Hampton, 1998; B. 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 in 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. Similar findings were noted by Mok and Wellman who also found that as distance increased there was a reduction in social contact. In particular they found that as contacts were more than 50 and 100 miles away there was a substantial decline in interaction (Mok and Barry Wellman, 2007).<sup>iv</sup>

The mobile phone needs to be seen in the light of propinquity.<sup>v</sup> The self-report material from the Pohn/Michigan study shows that there is, to some degree, a preference for calling local interlocutors. The data from that study shows that about 60% of the respondents called only to others who were within five miles (8 km) (Traugott et al., 2006). Based on this data, Campbell and Kwak report that texting and mobile voice interaction support local sociation (Campbell and Kwak, 2010). They note that the mobile phone supports the individual's participation in local clubs and organizations as well as interaction with family and friends. The work of Rivère and Licoppe shows that the mobile phone and texting has a central role in maintaining "intimate bonds" (Rivière and C. Licoppe, 2005). This general finding is also seen in Tillema, Dijst and Schwanen 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 (2010). They suggest that as people are further away from their contacts, they are increasingly "out of sight, out of mind."

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, who drew on the movement patterns of 100,000 anonymized mobile phone users over a six month period, there is a high degree of temporal and special regularity in our movements (González et al., 2008). The work by Calabrese et al follows this point by showing that 90% of the people who have called one another have been within the range of the same cell tower (2011; see also C. A. Hidalgo and Rodriguez-Sickert, 2008; Igarashi et al., 2005).

## Method

In order to better understand the distance based use of the mobile phone we were able to extract an anonymous sample<sup>vi</sup> of approximately 24 million anonymous calls and texts made by private subscribers in Norway. We used anonymous user log data to measure the distance between the residential postal codes of individuals who are calling and texting. 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. Privacy issues however, dictate that we use the postal code.<sup>vii</sup> Regardless, this approximation provides insight into the way that the devices are used in daily life.

The location of the postal code was converted to GPS coordinates using a script that did a lookup of postcodes. For each call or text distance between interlocutors was then calculated from GPS coordinates to kilometers using the spherical law of cosines. The median values were used in the analysis in order to reduce the effect of extreme cases. We have used a symmetric version of the call network, i.e. the direction of the calls and SMS are 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. Given the many tens of thousands of private subscribers in the database, this is an inconsequential number that does not significantly bias the results.

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 three 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, etc. We have developed filters and filtering techniques with which to eliminate calls and texts that are machine generated or based on automated commercial interactions.

## Findings

The data shows 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 . The material shows that the most frequent distance is zero, i.e. two people that have the same post code are calling or texting one another the most. The maximal distance was 1767 kilometers. It is interesting to note that the maximum distance in Norway, i.e. the distance between Lindesnes-Vardø is 1777.

To put the material in Figure into perspective, 20.1% of all links were in the same postal code and 42% were within 10 km. Further 23.9% of all calls/texts were more than 100 km away with a small peak at about 300 kilometers, the distance between several of the largest cities in Norway. The data also shows that 1.8% were between people were more than 1000 km apart. The material in Figure 1 does not examine the data by the strength of the link. This analysis is presented below.

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Insert Figure 1 about here

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Figure 2 shows the median distance between links of different rank for people living in cities, towns and in the countryside. Slope of the curves shows that the strongest links are generally the closest. The ties with the highest strength are between 8 and 10 km distant with the people living in towns showing somewhat shorter distance to 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.<sup>viii</sup> That is, it would take approximately 20 minutes to drive this distance if there were no traffic. It is also worth noting when viewing Figure 2 that we are in contact with only the first handful of ties on a regular basis. Thus, it is relatively rare that we call those who are more socially remote.

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Insert Figure 2 about here

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Another way to look at the material was to consider the percent of links that communicated over different social distances. The data in Figure 1 shows the percent of a particular link strength that were, for example less than one kilometer apart, 1 to 24 kilometers apart, etc. This analysis is applied only to the people calling from the cities. About 3% of the calls included in this analysis were to the strongest tie that was within walking distance. Another 3% went to strongest tie that was within convenient driving distance. If we sum the top five ties for the “walking” and “city” distances, this encompasses about 25% of the calls. 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% of trips in Norway are less than 20 km 2001 (Denstadli and R. J. 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 go to the people (regardless of link strength) living within what we call the city distance. Further 16% 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.<sup>ix</sup>

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Insert Figure 3 about here

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## Discussion

The material presented above shows that distance matters in relation to the strength of telephonic links. If we can also make the assertion that our strongest ties — that is those persons with whom we communicate most often — are socially close (Hampton and Ling in press; Ling et al. 2013; Boase and Kobayashi 2012), the material examined here combines with that to suggest that both social and physical nearness are characteristics of mobile phone communication. That is, a large portion of our calls and texts go to people who are both relationally and physically close. While there are virtual interactions with distant individuals and while we use the mobile phone to interact with people who are “weak links,” it is not these interactions that make up the greatest use of mobile telephony. These findings support the suggestion that the mobile phone is, in many ways, a device that helps us to coordinate our daily affairs among a relatively limited number of people in a relatively limited sphere of action. This finding can be examined against the

relatively short life span of the mobile phone. In this section we will put this development into a broader social context. One question is whether the rapid adoption of mobile communication is the result of other social and technical developments and a second question is whether its adoption has led to any changes in social structures.

Looking at the first question, the use of the mobile phone, and the distances that we call across, needs to also be seen in the context of the geographical structure of society. Specifically it is important to see the interaction between the mobile phone and automobile based transportation. The car changed the way that we socialize, shop and work (Ling, 2012). In the words of Urry, it has unbundled “territorialities of home, work, business and leisure that were historically closely integrated” (2007). As we have seen, much of our mobile communication is with others with whom we co-occupy these geographies. Previous to the rise of the car, there was largely only the need for local transportation and local communication. Sociation was constrained to those who were within a short distance that could usually be covered by walking. Society was organized around local shopping, work, schooling, etc. Indeed, previous to the car, people rarely traveled more than one mile to work (Jackson 1985, 15; Elliott and Urry 2010). This meant that messages, and for example familial coordination, were done by word of mouth (R. S. Lynd and H. M. 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 WWII spread of automobile-based transportation greatly expanded our radius of action (Flink 2001). Cities, and their suburban fringes were extended across the landscape. According to Gottman, the landline telephone system was an important element in this development. He noted “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” (1977, 307). He continues, “The generalization of the individual motorcar and of the telephone have actively aided suburban sprawl” (1977, 312). Gottman’s comments are based on the geographically fixed landline telephone. 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. We can be at home, in the office, on the bus or shopping. Regardless of location we can call and be called. This immediate availability to one another allows us to coordinate our interactions in this broader geographical landscape. There is not the need to call a fixed location telephone where our intended interlocutor may or may not still be. The functionality of the mobile phone facilitates coordination. It makes it more flexible and dynamic. We can adjust and change our meetings and interactions as need and exigencies arise (Ling and Yttri, 2002).

All of this suggests that our willingness to quickly adopt the mobile phone was at least partially driven by the need to facilitate interaction in a geographical setting that has been extended by the car and car-based transportation. While Gottman (1977) suggested that the landline telephone facilitated the growth of the cities, the mobile phone simplifies the interaction between coordination and transportation. It means that we can have 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 as well as 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 that 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.

The mobile phone allows us to touch base with and to make a plan as to how these diverse and moderately distant activities are to be covered. We use the phone 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 structured situation of the pre-auto world, we use the phone to manage tasks with a range of people. The mobile phone provides immediacy and flexibility in this complex of interactions. Urry states: "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" (2007, 176). The nuanced interaction provided by the mobile phone was a perfect solution with which to coordinate activities that had been spread across city-sized, car-only expanses.

This raises the second question, namely the effect of mobile communication on social structure. The mobile phone is a useful tool in the management of our daily interactions. It has an undeniable utility to the individual and it has found a secure place in our daily routines. Moving beyond this to examine the social level of analysis, the mobile phone is being structured into our interactions, that is it is becoming taken for granted (Ling, 2012).

We expect that others, and in particular our closest ties are continually available to us via the mobile phone. Indeed, we increasingly take it for granted. Not to have our phone with us is, in some ways, being irresponsible towards our social sphere. We see this in two ways. One is simply in terms of coordination. As noted above we increasingly structure our daily routines and our social interactions on the assumption that others are available via their phones. We assume that we will be able to reach a spouse later in the day when we need to decide on the menu for dinner, the division of shopping and child delivery tasks, the arrangement and distribution of social responsibilities, etc. We are also moving away from using specific times and locations to coordinate our meet-ups. Instead, we might simply plan to meet a friend "downtown on Saturday." In this form of coordination we have a general idea that we will both be in the same general area between, for example 2 and 4 PM. In this mode of coordination, however, we wait until we are downtown before we do the immediate planning of where and when we will meet.

If one of us has have forgotten our phone or if the battery has run down, we are not able to firm up the coffee date. We can leave one another voice mails or send texts. However we will not be able to respond to one another. By the time our coffee partner gets our (perhaps increasingly frustrated) message, it is too late. Our willingness to rely on mobile-based interaction shows how the device, and our use of it for planning, is becoming structured into the routines of our daily lives. We can see this when we are not able to fulfill a social obligation when the coordination system is not in place.

We arrange our lives with the assumption that those significant others with whom we need to interact will be available in an ad hoc basis, just as our potential interlocutors also assume that we are available. Indeed, it is a problem for other people when our mobile phone is forgotten or if it is in disrepair. Our potential interlocutors have to work around the fact that you are not in the loop. There are alternatives such as using the landline phone or perhaps calling another friend's mobile phone who may be with us at the time. All of

this is guess work and less sure. These are all work arounds. There is increasingly the assumption that we are available to one another through the mobile phone and the failure of that link makes coordination difficult if not impossible. That is, the mobile phone is being structured into our interaction with the closest sphere of friends and family who are also the closest to us geographically.

The mobile phone is becoming structured into our expressive interactions. When thinking about how we use the mobile phone for task coordination we see one type of expectation. However, it is also possible to think about how we use it in interaction (and potential interaction) for expressive purposes. Obviously, the mobile phone can be used to send love messages and it can be used as a channel through which we can vent anger.

Another more instrumental motivation for having a phone is that it lets us contact one another in the case of a large or a small emergency. It is not necessarily the case that we will for example receive a call from our child who suddenly needs a ride to their soccer match when they are too late for the bus. However, we have the idea that we want to be available to one another for these types of situations. It is not necessarily the actual ability to communicate. Rather it is the chance that we will need to communicate that is the key. In the words of a focus group participant, we have a mobile phone “just in case.” The mobile phone and the ability to contact another person is something akin to an insurance policy. We have in case the need arises. We have it in case we get a flat tire along the highway or in case we are unexpectedly delayed. We have it if our partner or our child suddenly finds him/herself in dire straits.

Taking this to its horrible extreme, we saw this in the reaction of people who were in Oslo in the minutes after the bombing on 22 July 2011. The data show that there was a rush to call one another literally when the sound was still reverberating and the smoke was only starting to rise into the sky. As in the paper here, it was the strong ties that were important. Generally, people called their strongest tie first, next strongest tie second, etc. (Ling et al., 2013b). People needed to touch base and to inquire as to the welfare of their closest ties. Interviews showed that they exchanged some words of concern and perhaps shared information. The mobile phone allowed for this type of remote care giving. Indeed, the fact that this channel was used to the degree that it was shows how the mobile phone has become a central channel for communication in the intimate sphere. In this situation and in others that are similar (Cohen et al., 2007; Katz and Rice, 2002), we dearly want to hear the voice of our closest family and friends.

All of this underscores the importance of the mobile phone for the maintenance of the intimate sphere. The reciprocal nature of mobile communication shows that when a technology of mediation becomes embedded in society it is not simply done for the benefit of the individual. Rather, there is a decidedly social aspect to this. Mobile communications (including a variety of social networking applications) are increasingly structured into the way that we interact with our social sphere. We make agreements and we work out plans with one another. In this work we assume that our interlocutors will also be more or less continually available so that we can iteratively refine the planning. We also feel the need that they are available “just in case.” That is, the mobile phone — and increasingly mobile versions of social networking sites — is interwoven into the flux of our daily lives and, more to the point; we expect them of one another.

The data shown above indicates that local interaction is a part of this picture. It is clear that we cannot easily examine the types of calls being made, but the literal volume of calls as shown here, and the limited number of others with whom we interact that is shown in other research (Ling et al., 2012) point to the

idea that the mobile phone is an instrument of the intimate sphere. It is a tool through which we reciprocally cultivate and maintain our closest ties.

While it is often beguiling to think that we use the device to interact on a broad stage, the material here shows that the vast majority of people travel in small circles, both socially and geographically. While there is the possibility to call people at the far corners of the world, the material here shows that our horizons are more limited. The preponderance of the calls made by Norwegians are to people who are only moderately distant, i.e. within 25 km. This is the hard data. The material leaves us to speculate as to why this might be. The structure of our automobile based lives, the movement of women into the workforce and the increasingly car-based activities of children are all a part of the answer. This development means that we need to coordinate 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 these tasks. It is, indeed becoming a structured part of our lives. Increasingly it is a device through which we are perpetually available to our social sphere, and reciprocally how they are available to us. The material here shows that these interactions are not on a broad geographical stage.

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 communication. Real social interaction has a large component of copresence 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, copresent interaction is foundational.

As with any study, there are limitations associated with this paper. First, the use of the postal code with which to determine the distance between links is not as precise as one might wish. Thus, the postcode distance serves as a proxy for the more exact distance of the call or text. This is the result of the respect for privacy. Second, there is no ability to examine either the content of the calls nor the motivation of the caller in making the calls. The data only describes the existence of a communication between nodes. There is no ability to examine the nature of the call or its motivation. Third, internet protocol forms of interaction (IP) such as Skype, Whatsapp, etc. 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 the voice over internet (i.e. Skype, Viber, etc.) forms of interaction are making inroads into this dominance and it is worth future analysis. Fourth, the material comes from Norway that is a small, affluent and somewhat unique location. There is nearly universal mobile phone ownership among the population and 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% of all subscriptions in the country. As the former incumbent operator, the users are somewhat older than the population as a whole.

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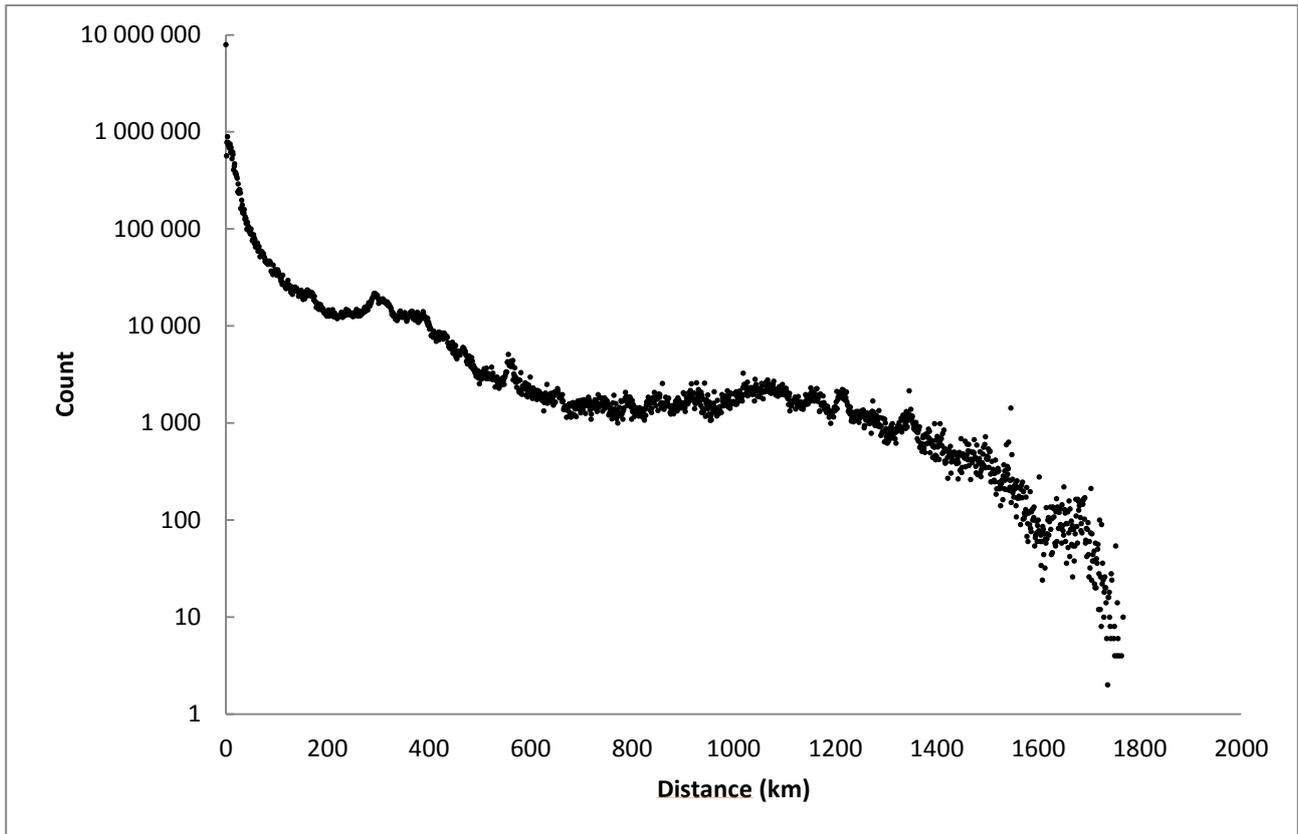


Figure 1 Absolute distance for all links in kilometers (Note: Count is represented in a logarithmic scale)

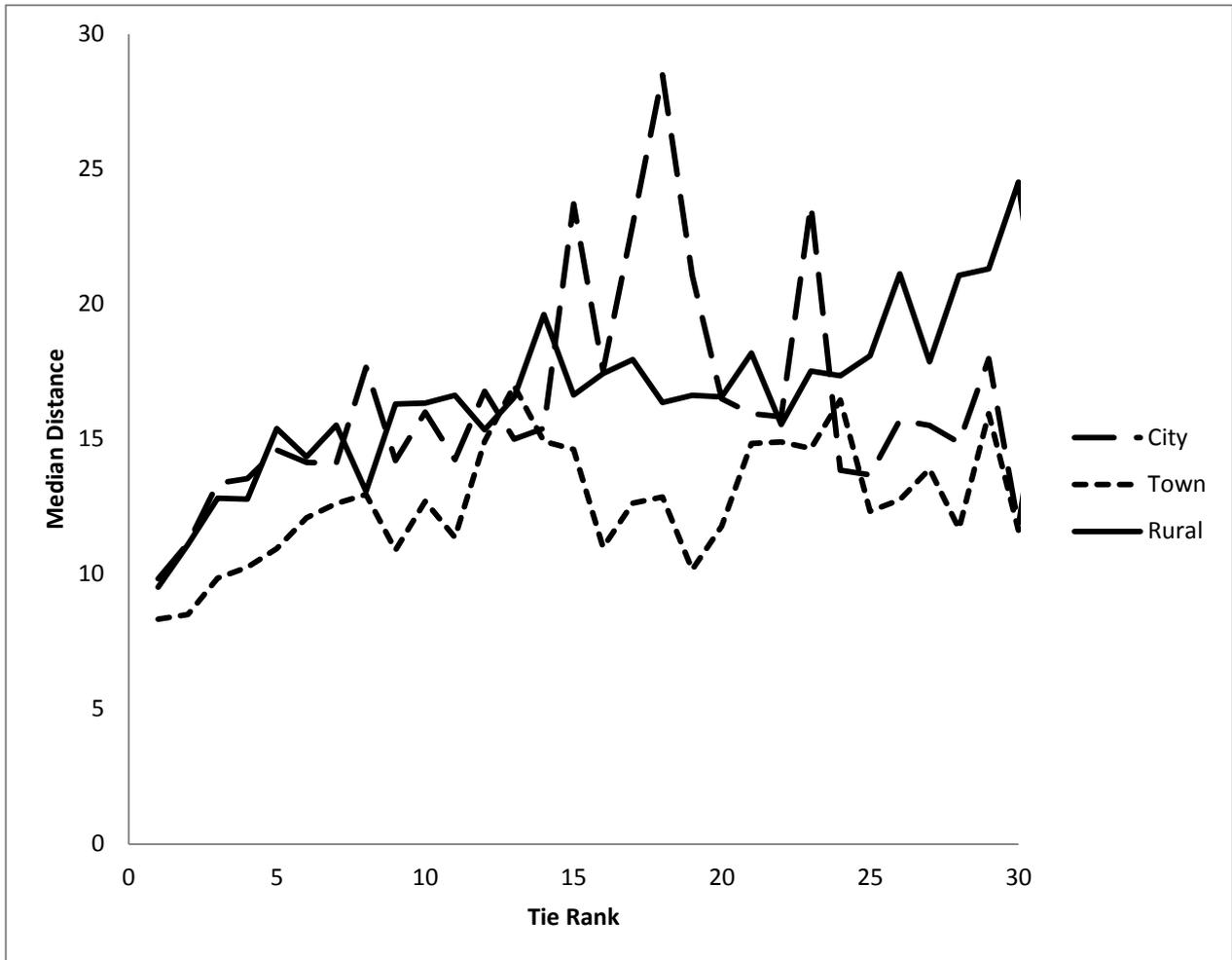


Figure 2 Median distance between links by link rank for people living in different situations

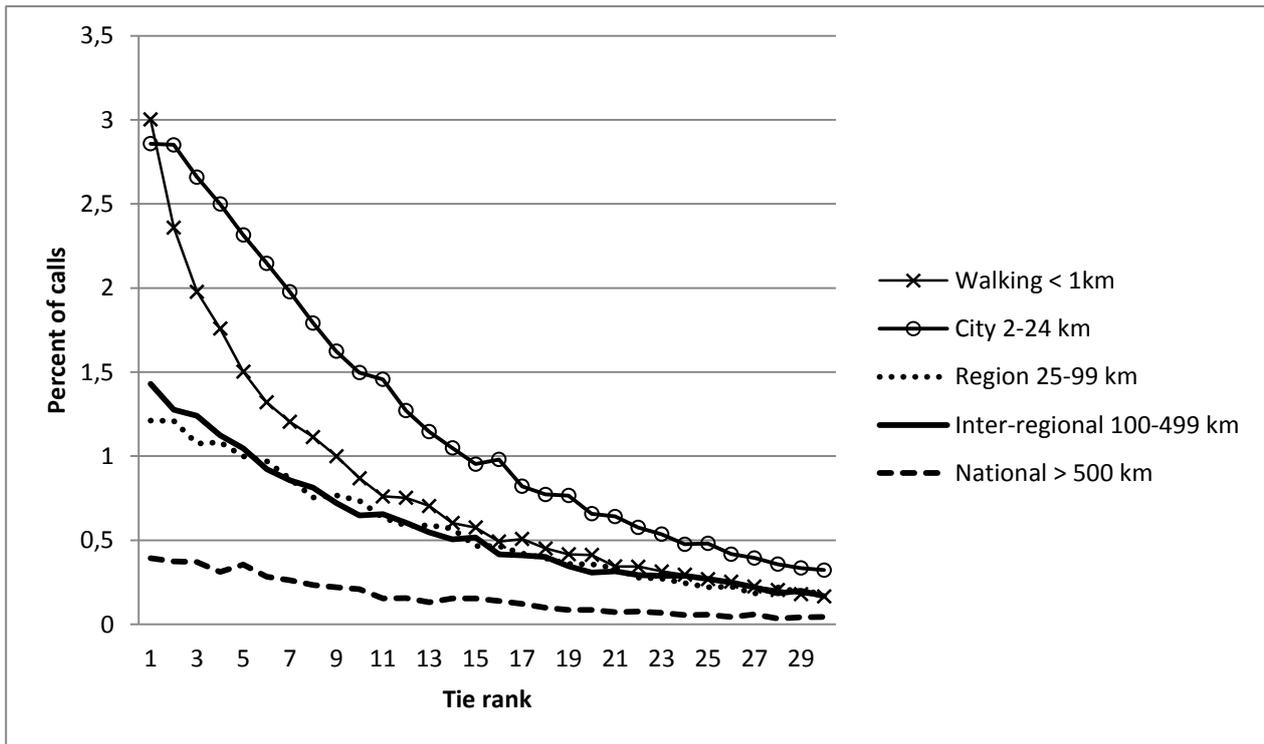


Figure 1 Percent of calls to top 30 links by distance of the interlocutor

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<sup>i</sup> The data for this analysis includes the call data records for a sample of subscribers to the Telenor system as of the second quarter 2011. In this analysis, tie-strength is defined as the person to whom we called the most during that three-month period.

<sup>ii</sup> In this paper, we use the term 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.

<sup>iii</sup> These comments and the other citations come from a series of focus groups held in Norway sponsored by Telenor. The results are unpublished.

<sup>iv</sup> When looking at telephonic interaction there was not the same pattern. Rather, the decline took place at about 100 miles. They 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 likely landline based. There was, for example, no discussion of texting that Licoppe has found so important in his discussions of connected presence (Christian Licoppe, 2004). There is, however the suggestion that location matters in the use of the mobile phone.

<sup>v</sup> This is not necessarily a foregone conclusion. The dynamics of nation-wide subscriptions and modern travel patterns might suggest that mobile traffic is geographically diffused. Indeed the mobile phone was a godsend to people whose travels took them over wider horizons. Business people, for example were early adopters, specifically because, in the words of one interviewee, from 1995 "We would not have the possibility to reach all the things we need to do. There would have to be more people involved. It gives us a lot more freedom. You are always in contact with the main office and at the same time, you are in contact with the international suppliers" (Elliott and Urry, 2010; Larsen et al., 2007; Ling, 2012). This material comes from an internal Televerket report on the potential of mobile communication. Portions of the material have been examined and published by Ling (2012, 1997).

<sup>vi</sup> 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. These were from the data warehouse of Telenor, the former incumbent operator who has approximately 60% of the subscriptions in the country. The customers of Telenor are somewhat older than the general population in Norway.

<sup>vii</sup> To be sure, the postal codes are not a standard unit. Those in the city can be small while rural postal codes can be large. This certainly colors the analysis to some degree. Each postal code has approximately 1000 persons which is much smaller than the comparable zip code in the US that has about 25000 persons.

<sup>viii</sup> In 2009 the average distance for a personal trip was 12 km for all Norwegians regardless of where they lived and 14,72 km for people living in rural areas (Brechan and Line 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 were 18.3 and 14.0 km respectively (Lene Vågane et al., 2011). Aside from these two groups the commutes 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.

<sup>ix</sup> 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 kilometers for calls between women and 15.7 km for calls between men. This reflects the findings of Hjorthol who noted that women generally operate in a space closer to home and men often work further away (R. J. Hjorthol, 2000)