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The Role of Mere Closeness: How Geographic Proximity Affects Social Influence

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Report summary

In the past years, two trends have created new challenges for marketers. First, consumers have grown to rely on advice from other consumers—for instance, through online reviews on TripAdvisor, Expedia, or Yelp. Second, consumers increasingly provide marketers with personal data—especially geographic information—by using their mobile devices for shopping purposes or product search.

The question is, can marketers exploit these two trends and use geographic data to actively manage product recommendations?

In this report, Jannik Meyners, Christian Barrot, Jan Becker, and Jacob Goldenberg provide insights into the role of geographic proximity for recommendations and online reviews. In four studies that cover both extensive field and experimental data, they show that geographic proximity increases social influence and demonstrate its interdependency with social closeness.

The results indicate, first, that the role of geographic proximity for social influence is not simply a result of the higher likelihood of social interaction and, second, that the effect of geographic proximity increases with decreasing tie strength between sender and receiver of a recommendation.

In three experiments, the authors demonstrate the monetary value of their findings by analyzing consumers' willingness to pay more for products recommended by someone geographically close. Additionally, they show that the effect of geographic proximity is mediated by perceived similarity (i.e., homophily) between consumers.

These results imply that geographic location may well strengthen social influence. Consequently, companies could sort reviews so that those from geographically close users are displayed first. By implementing such an individually tailored review order, consumers would receive more helpful reviews that lead to higher conversion rates and purchases of products that suit their needs.

The report also offers insights to increase the effectiveness of social media advertising. In online social media such as Facebook, Google+, or Twitter, the users' geographic location is typically available and can be used to target social ads, i.e., ads that show Internet users the products or services that their contacts like, follow, or use. The report's results imply that advertising with contacts that live in geographic proximity to the user (e.g., "Bill likes Company *x*") could be more influential than advertising with someone geographically distant.

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The Role of Mere Closeness—
How Geographic Proximity Affects Social Influence

Introduction

Many services, *Expedia*, *TripAdvisor*, and *Yelp* to name a few, provide online reviews and recommendations of various offers. Assuming the service provider is interested in presenting those recommendations and reviews that consumers will find the most helpful, how can such recommendations be prioritized? In most cases, there is no prior information about consumers who are making their first visit to a site and therefore, there is no way to select the recommendations that may be the most relevant and helpful. In this paper, we show how geographic location information influences recommendation seekers and thus can be used by firms to increase the efficiency of the reviews that they post.

Through the rapid technological developments of recent years, consumers increasingly use their mobile devices (e.g., smartphones or tablet PCs) for many online activities such as searching for products, shopping, booking vacations, etc. Although companies and marketers are overwhelmed with tons of data on consumers' behavior, preferences, and social networks, it seems that one of the most common and increasingly used data points is geographic location. A large trend toward geo-marketing has evolved recently (Luo et al. 2013): consumers' geographic information of consumers has become available and more relevant than ever because of new technologies and communications methods that provide consumers' exact GPS coordinates (Crandall et al. 2010; Takhteyev, Gruzd, and Wellman 2012). Social networking sites offer location-based services, thus making geographic location and proximity to service providers important in real time (Bell 2014; Shi and Whinston 2013). For instance, *Apple*'s App Store offers customers the ability to search for apps that are popular among users within their geographic vicinity, and platforms such as *Yelp* or *TripAdvisor* base their recommendations on users' current geographic location. Today, a large number of companies even base their entire business model on the availability of information about consumers' geographic location and links between consumers, seeking to employ this information for marketing and customer-management purposes (Xu et al. 2011).

Simultaneous with the ubiquity of customer location data, a second major trend has evolved in marketing in recent decades, namely, the importance of online advice and referrals (as part of word-of-mouth) compared to 'traditional' advertising messages (Bughin, Doogan, and Vetvik 2010; Hennig-Thurau et al. 2010). Recommendations by a consumer's peers and (even if the user is unknown) through online reviews such as on *Yelp* or *Amazon* are considered more credible and thus increase influence on consumers' purchase decisions (East, Hammond, and Lomax 2008).

Nevertheless, despite the large body of research on the role of geographic proximity in the likelihood of social influence (Van den Bulte 2010) and the conditions for successful word-of-mouth (i.e., social influence) among consumers (Libai et al. 2010), little empirical evidence indicates the extent to which this increasingly available geographic data can be used by companies to actively influence consumers' product recommendations. Although the mere likelihood of social influence has long been known to be higher in geographic proximity (Festinger 1963; Hägerstrand 1967), insights into how geographic proximity affects the strength and therefore the success of social influence are sparse. Many recommendations such as online reviews are partially or even fully decoupled from the likelihood of actual social interactions; this phenomenon underlines the high relevance of understanding how geographic proximity affects social influence both in the presence and in the absence of actual social interactions. This article addresses the importance of geographic information, how it influences consumer decisions, and most importantly, how this information can be used to influence customer behavior. Thus, we contribute to marketing research and practice by examining: *i*) the importance of geographic proximity for social influence and its interdependency with social proximity, *ii*) the role of geographic proximity in the event that social proximity is absent (such as in online reviews), and *iii*) the influence of geographic information on the willingness-to-pay for products and services and therefore, the economic relevance of geographic data. Our findings contain easily implementable managerial implications for managing online reviews, advertising in social networks, and product recommendations among peers.

Based on a large set of customer data from a mobile operator, we analyze the interactions between geographic and social proximity. The results demonstrate that social influence from a geographically closer person is significantly stronger in a manner that is independent of the mere likelihood of social interaction; in addition, the results indicate that the effect of geographic proximity increases with decreasing tie strength between the sender and receiver of a product recommendation. In three experiments, we further demonstrate the monetary value of our findings through consumers' willingness to pay for products recommended by someone geographically close to them and show that the effect of geographic proximity is mediated by perceived homophily between consumers (how similar one person perceives the other).

If correct, our findings offer the important implication that firms can select reviews and recommendation to present those written by individuals with local proximity to the information seekers. This can help both firms and consumers equally assuming firms do not bias the reviews, because information seekers prefer to read and are more willing to be influenced by geographically closer reviewers.

Theoretical Background

Geographic proximity and social influence

The importance of geographic proximity to information dissemination and thus to social contagion has been acknowledged since the early stages of innovation adoption research (Rogers 2003). In early work, Hägerstrand (1967) shows that the diffusion of innovations creates distinct geographic patterns. Because the likelihood and frequency of communication are greater when individuals are spatially closer to one another, innovations primarily diffuse on a local scale. As a result, spatial clusters emerge in which the diffusion of a new product is much higher than in other geographic areas (Strang and Tuma 1993). Because a spatially heterogeneous diffusion indicates that an innovation is more likely to be successful, Garber et al. (2004) demonstrate how the emergence of spatial clusters can even be used to predict product success. Thus, the importance of geographic proximity to social contagion has been repeatedly proven in marketing research not only on interaction between consumers (Bell and Song 2007) but also on information transfer between firms (Agrawal, Kapur, and McHale 2008; Angst et al. 2010; Barrot et al. 2008; Bronnenberg and Mela 2004).

One limitation of these studies, however, is a lack of actual social network data; thus far, the influence of geographic proximity itself cannot be distinguished from consumers' social proximity. Because social network proximity and geographic proximity are highly interlinked concepts, geographic proximity can be a valid proxy if network data are absent (Manchanda, Xie, and Youn 2008; Nam, Manchanda, and Chintagunta 2010; Van den Bulte 2010). However, this interdependency also implies that a lack of network data makes it difficult to determine whether geographic proximity actually affects social influence or whether it is merely social proximity that leads to spatial diffusion patterns (Brown and Reingen 1987; Frenzen and Nakamoto 1993).

One reason for this difficulty is the so-called propinquity effect, which can be defined as the higher likelihood of formation, maintenance, and strength of social-network ties in geographic proximity (Preciado et al. 2011). Multiple studies have shown that the likelihood of the formation and maintenance of social ties between individuals can be expressed as an inverse function of the geographic distance between them (Levy and Goldenberg 2013). Although this relationship holds true for large distances (such as those between cities or regions; Lambiotte et al. 2008; Mok and Wellman 2007), it also applies to very small differences, such as the distance between rooms in student dormitories (Festinger 1963). Interestingly, the emergence of new communication technologies whose financial costs are independent of geographic distance has not altered this relationship (Mok, Wellman, and Carrasco 2010). For instance, distributions of *Twitter* links, ties on social networking sites, and email traffic remain a function of geographic distance that steeply declines beyond a few miles (Lee, Scherngell, and Barber 2011; Takhteyev, Gruzd, and Wellman 2012).

Thus, although it is well established in the literature that the frequency of interaction and communication depends upon geographic proximity (the propinquity effect), it remains uncertain whether social influence from geographically close individuals is not only more likely to occur but also stronger—apart from mere propinquity and social closeness. To address this gap, we build on earlier studies of social influence in geographic proximity (Bradner and Mark 2002; Latane 1981; Latane et al. 1995; Moon 1999) and the effect of spatial distance on psychological distance (Fujita et al. 2006; Henderson et al. 2011; Trope and Liberman 2010) that do not incorporate social closeness and the propinquity effect. In this paper, we therefore analyze the strength of social influence among consumers depending upon geographic proximity in social networks and its implications for marketing purposes to manage recommendations.

Homophily as a mediator of geographic proximity

When considering the factors that typically affect the strength of social influence among consumers, previous research has identified dyadic network traits (i.e., traits that describe the relationship between two individuals) to be most important, for instance, tie strength, communication, and mutual trust (Gilly et al. 1998). In particular, homophily has been repeatedly shown to be decisive in consumers' decisions concerning which product to adopt (Nejad, Amini, and Babakus 2015). Generally, homophily explains the tendency of individuals in social networks to form ties with other individuals who are similar to themselves; therefore, it refers to the degree of similarity between two individuals (Kossinets and Watts 2009; McPherson, Smith-Lovin, and Cook 2001). In this respect, there are two reasons that high degrees of homophily can explain concurrent adoption between two consumers. First, because homophily implies that consumers have similar tastes, consumers with high levels of homophily are more likely to adopt the same products (Aral, Muchnik, and Sundararajan 2009; Ma, Krishnan, and Montgomery 2014). Second—and more relevant to our research question—the degree of homophily determines the amount of influence that two individuals can exert on one another, which is why they are likely to adopt the same products because of stronger social influence (Rogers and Bhowmik 1970). Numerous studies show that the degree to which a recipient considers a sender of social influence to be similar to her or him is associated with how likely the recipient is to change his or her attitudes and act on the sender's recommendation (Brown and Reingen 1987; Feick and Higie 1992).

Because this is a highly multidimensional construct, there is a wide variety of dimensions on which two individuals can either be actually similar or merely perceive themselves to be similar (Lazarsfeld and Merton 1954). These dimensions can either be objective (e.g., age, gender, or income) or subjective (e.g., lifestyles, values, beliefs, or attitudes; McPherson, Smith-Lovin, and Cook 2001; Rogers and Bhowmik 1970). Multiple studies have demonstrated that both objective, demographic homophily (Brown and Reingen 1987; Nitzan and Libai 2011; Risselada, Verhoef, and Bijmolt 2014) and subjective homophily strongly affect word-of-mouth and the strength of social influence (Gilly et al. 1998). A higher level of homophily increases the likelihood that the recommendation will be perceived as credible, helpful, and suitable to the receiver's needs. This positive perception of the recommendation serves to reduce the uncertainty that customers face before making a purchase decision (Gilly et al. 1998; Schmitt, Skiera, and Van den Bulte 2011). Moreover, interpersonal similarity has been shown to decrease the level of psychological distance such that actions from similar individuals are construed in more concrete levels, leading to increasing the individuals' influence on one another's decisions (Liviatan, Trope, and Liberman 2008; Zhao and Xie 2011).

However, what if people know one another only a little or not at all and consumers are unable to rely on homophily? For instance, consumers receiving a product recommendation from a remote acquaintance cannot validly assess whether the recommender is actually similar to him or her. In many contexts of online peer influence (e.g., customer reviews on shopping websites), the reader of a review does not know the author at all and faces uncertainty concerning whether a recommendation should be followed. In that circumstance, consumers must use cues that allow them to derive the level of (perceived) homophily to the recommendation sender. These cues can take the form of the sender's available personal information or take more subtle forms, such as the sender's style of communication (Berger and Iyengar 2013; Moon 1999; Naylor, Lamberton, and Norton 2011).

We propose that consumers use geographic proximity to senders of social influence as a cue for their level of homophily with those senders. To support this proposition, different theoretical streams can be used to argue for the proposed relationship between geographic proximity and perceived homophily. First, geographic space can be considered a source of homophily because neighborhoods are often homogeneously formed with respect to social, economic, or educational attributes (Hipp, Faris, and Boessen 2012; McPherson, Smith-Lovin, and Cook 2001). As a result, deriving homophily based on a shared geographic location can be reasonable, although, in reality, the relationship refers only to a limited geographic area (that is, a neighborhood). Second, according to construal level theory (Trope and Liberman 2010), both the degree of homophily and spatial proximity are shown to determine the level of psychological distance (Fujita et al. 2006; Henderson et al. 2011; Liviatan, Trope, and Liberman 2008). That is, how events are construed and information is processed work similarly for spatial distance and for the level of homophily. Thus, we argue that if no information about the actual level of homophily is present, consumers might use spatial proximity as a 'proxy' for the level of homophily to construe and process recommendations. Furthermore, to cause a consumer to feel more similar to another because of geographic proximity, the geographic area in question (for example, the consumer's neighborhood, city, region, or state) must serve as an indicator for specific traits that individuals are expected to share. In this respect, social identity theory (Tajfel and Turner 1986) might serve to explain more-general relationships among geographic proximity, homophily, and social influence. According to social identity theory, a geographic area can be considered part of one's social identity which might make consumers to perceive geographically close individuals to be more similar to them (Huddy and Khatib 2007; Ren, Kraut, and Kiesler 2007; Tajfel and Turner 1986).

As a result, we propose that the level of perceived homophily is higher which is why geographic proximity increases the strength of social influence that a recommendation has on individuals.

Below, we analyze the effect of mere closeness on social influence through four studies. In *Study 1*, we use field data to examine the effect of geographic proximity on social influence and its interplay with social closeness controlling for the propinquity effect. In *Study 2*, we study the role of geographic proximity on social influence in the absence of actual social interaction and test the mediation of perceived homophily using a discrete-choice experiment. In *Study 3*, we extend the experimental setup to test the monetary value of the geographic proximity effect to evaluate its managerial relevance. In addition, we test the managerial application and the boundary conditions of the effect in *Study 4*.

Study 1

As mentioned above, it is unclear whether geographic proximity is merely a proxy for social proximity or whether it increase social influence of its own and how the two phenomena interact. Thus, the purpose of the first study is to examine the role of geographic proximity in social influence in a real-life setup by controlling for the propinquity effect. Using comprehensive social network data, we analyze how the effect of geographic proximity changes with the strength of relationships between consumers. Specifically, we analyze how potential adopters of a mobile-phone provider are influenced by previous adopters within their social networks both by incorporating information about the geographic distance between potential and previous adopters and by controlling for their social networks.

Data

For our analysis, we use data from a mobile-phone provider operating in a large European country to model previous adopters' social influence on later adopters' adoption decisions. The company is a no-frills provider, which was an innovative concept in the market at the time of our analysis. In other words, the provider does not possess its own network infrastructure but instead acquires network capacities from a cooperating network operator. The company did not operate its own stores but primarily distributed its products online and to a lesser extent, via national (ubiquitous) supermarket chains. As a result, we do not observe regional differences with respect to the availability of physical stores and their distance to consumers (Bell 2014). The network coverage in the country of our analysis is approximately 99% for all network operators; thus, no significant differences among geographic regions and providers appear with respect to network reception and service quality. The mobile-phone industry is highly suitable for our analysis because it is a product category for which word-of-mouth has proved to be very important because of uncertainty about quality and a lack of ability to try the product beforehand (Murray 1991; Verlegh et al. 2013). Typically, the search for a new provider is performed with high involvement and is fraught with both uncertainty and high switching costs, for example, the need to change one's phone number. Another advantage of this product category is that the use of a specific mobile-phone provider is not passively observable to others; instead, customers must actively exert social influence on one another, which ensures that our analysis is not confounded by alternative types of social contagion such as observation (Manski 1993; Van den Bulte and Lilien 2001).

The data set comprises information on 509,191 customers who signed up with the provider during our observation period, which spanned more than 37 months from market launch. The customer data include individual-level information on date of adoption, age, gender, zip code, and encrypted last name. To ensure data privacy, although the actual names have been encoded, the code still enables an analysis of whether customers have the same last name. Additionally, we tracked the provider's call records of all customers using encoded phone numbers for the entire observation period. The call records include all calls and text messages both to the provider's other customers and to non-customers. The duration and number of calls and messages are aggregated per dyad on a monthly level, resulting in information about more than 100 million phone connections. Having tracked all outgoing calls, the call records allow us to reconstruct each customer's individual social network, that is, all contacts that a customer has, including social ties (i.e., relationships or links) both to existing customers and to customers of other providers. Furthermore, these data enable us to compute network measures such as the strength of a customer's social ties. Mobile-phone data have repeatedly been shown to be a valid and highly representative proxy for actual social relationships between individuals (Onnela et al. 2007; Shi, Yang, and Chiang 2010). Considering not only the 509,191 customers of the provider but also their social ties, we construct a social network with more than 14 million actors (i.e., individuals). In addition to the individual-level data, we recorded the provider's monthly advertising spending. The data include total monthly spending and spending on specific media, such as newspaper, television, radio, and the Internet. By matching the advertising data with the geographic scope of each medium, we can obtain the advertising spending per month at the zip-code level to control for regional heterogeneity as a potential reason for spatial contagion. To further control for regional attributes, we obtained additional data such as the purchasing power in each zip code. A zip code refers to an area of 10,000 inhabitants on average, which is the lowest possible aggregation level with respect to the available spatial data.

Method

We use comprehensive data on the dates that each customer adopted the product and multiple sources of influence on each potential customer to develop an empirical model that measures the effect of each of the drivers on the adoption decision. Specifically, we examine the extent to which social contagion affects the decision to adopt the provider by analyzing geographic proximity among consumers and controlling for numerous sources of influence and social network traits. Given the dynamic nature of the data, we use survival analysis, which is a method of examining social influence in the adoption context that is commonly applied because of its ability to handle time-invariant and time-varying covariates (e.g., Iyengar, Van den Bulte, and Valente 2011; Nitzan and Libai 2011). More specifically, we run a semi-parametric Cox regression model that includes time-varying covariates. One advantage of the semi-parametric model is the flexibility of the baseline hazard, which is determined during estimation and need not be specified beforehand (Blossfeld and Rohwer 2001). The baseline hazard captures the development of the hazard to adopt over time, which is typically increasing in adoption models. The model that includes covariates estimates the effect of each covariate on the hazard to adopt by using both time-varying covariates and time-invariant predictors. That is, the individual hazard to adopt at time *t* is denoted as (Kalbfleisch and Prentice 2002):

$$h_i(t|X_{it}) = h_0(t)\exp(x_{it}\beta'). \tag{1}$$

Equation 1 represents the individual hazard h_i to adopt at time t conditional on covariates X_{it}, where the hazard is either increased or decreased by the strength of effect of each covariate as denoted by β. H_0 represents the baseline hazard that is determined within the estimation. We model the continuous data such that we split the data into months (up to month t = 37) and measure for each month a prospect's covariate values and whether the prospect adopts in the corresponding month.

Variables and measures

The full model including all variables can be written as follows:

$$\begin{aligned} h_i(t|X_{it}) = f\,(&Exposure_{it}, GeographicProximity_{it}, \\ &NetworkOverlap_{it}, Household_{it}, TieStrength_{it}, \\ &Age_i, Gender_i, NetworkDegree_i, \\ &LocalPenetration_{it}, PurchasingPower_i, Advertising_{it}). \end{aligned} \tag{2}$$

The focal measure of our analysis is the prospect's exposure to previous adopters in his or her social network. The absolute number of previous adopters in a prospect's social network *($Exposure_{it}$)* up to the month in which the prospect adopts is measured with a time-varying variable per month. For the month of adoption, we measure daily exposure to prevent network autocorrelation (Manski 1993). The prospect's personal social network is derived from the call record, which has repeatedly been shown to be a good proxy for the actual social network (Onnela et al. 2007). Because the call record can only be recorded after adoption, we must assume that the social network itself is stable both before and after adoption, which is reasonable because social networks typically do not change based on the adoption of a new mobile-phone provider (Boase et al. 2006; Eagle, Pentland, and Lazer 2009).

We determine the geographic proximity to previous adopters using the GPS codes of the zip codes of the potential adopter and the previous adopter and by measuring the distance between these GPS codes in kilometers (km). The variable *($GeographicProximity_{it}$)* is operationalized as the inverse of the distance in kilometers and summed over all previous adopters in the prospect's social network. The inverse of the distance has been shown to represent the functional form that accounts for the non-linear decrease in the likelihood of communication and tie formation as geographic distance increases (Krings et al. 2009; Lambiotte et al. 2008; Levy and Goldenberg 2013). Furthermore, using the inverse ensures that geographic proximity can be interpreted as a continuous variable with values between 0 and 1, with 1 being the proximate distance.

As elaborated in the theoretical background section, it is necessary to control for the propinquity effect to analyze the actual effect of geographic proximity. Consequently, we use three measures that capture the relationship between geographic proximity and social networks. With respect to controlling for network formation in geographic proximity, we include a variable to measure the network overlap ($NetworkOverlap_t$) between potential adopters and previous adopters. The variable is operationalized as the proportion of mutual ties (i.e., individuals both actors are connected with) from prospect *i* and previous adopter *j* over the total of all of their ties (Jaccard index; Adamic and Adar 2003; Csardi and Nepusz 2006). As a further control for propinquity, we include a time-varying dummy variable that captures whether the prospect and the previous adopter belong to the same household ($Household_{it.}$).[1] However, because word-of-mouth obviously occurs within a household, controlling for it is necessary to capture the actual effect of geographic proximity (Gilly et al. 1998). To measure the $Household_{it.}$ variable, we develop a proxy that captures sharing both a last name and a place of residence.

Tie strength ($TieStrength_{it}$) to previous adopters not only serves to control for the propinquity effect and the typically higher tie strength in geographic proximity but is also tested in our paper as a moderator. According to our theoretical argument, if consumers use geographic proximity as a cue for perceived homophily, the effect of geographic proximity should become greater with decreasing tie strength. Because the previous adopter is less-known and consumers cannot fully assess the actual level of homophily, they draw on geographic proximity instead and infer homophily based on the geographical proximity of the previous adopter. With respect to the operationalization of the variable, we followed the approach taken by previous studies (Nitzan and Libai 2011; Risselada, Verhoef, and Bijmolt 2014), namely, tie strength between a potential customer and a previous adopter *j* is measured as the share of communication volume that the potential customer devotes to that particular previous adopter[2]. In the time-varying model, both network overlap and tie strength are measured as a sum over previous adopters in month *t*.

Additionally, we include numerous control variables that are important to adoption decisions and the susceptibility to social influence. The control variables cover time-invariant individual adoption drivers such as age, gender, and the prospect's social network degree (i.e., an individual's number of social ties), along with regional control variables such as the purchasing

[1] Unlike common offers in the U.S. market, the company in our study does not offer family or shared-value plans. Because household members purchase their SIM cards independently, we do not expect the role of geographic proximity to be artificially overestimated. This is further confirmed by running models that exclude household members altogether and that yield the same results.

[2] We also tested other operationalizations of tie strength, such as number of calls or a combination of calls and volume. All of the measures are highly correlated and the results are not altered.

power for the prospect's zip code. Furthermore, we include time-varying control variables to capture the local penetration rate such as the number of adopters per 1,000 inhabitants for each month in a prospect's zip code and the provider's advertising expenditures for the respective month and zip code, with a temporal carryover effect that is modeled as a geometrically distributed stock variable (Hanssens, Parsons, and Schultz 2001). *Table 1* provides an overview of the operationalization of all of the variables. The descriptive measures and correlations are displayed in *Table 2*.

>>>See Table 1 and 2, following References<<<

Results

Table 3 presents the results from the hazard regression estimated with 509,191 cases. Specifically, we use a nested approach and run three separate models both to break up the effects and to understand the role of single variables. *Model 1* measures the pure influence of geographic proximity to previous adopters on adoption, excluding all controls of the propinquity effect. *Model 2* controls for the propinquity effect to test whether the effect remains significant. Finally, *Model 3* adds an interaction between geographic proximity and tie strength. The results in all three models contain hazard ratios, that is, the exponent of the estimated coefficients. The hazard ratios are interpreted such that an increase of the variable by one unit increases the hazard of adoption by 1 hazard-ratio percent. All of the models have high explanatory power as indicated by the Chi^2 tests, and the signs of the focal variables and the control variables are in line with our expectations and comply with traditional adoption theory.

>>>See Table 3, following References<<<

Model 1 shows the high effect of geographic proximity ($\exp(\beta_{2,1}) = 1.074$, $p < .01$) on adoption. The coefficients refer to an increase of one standard deviation—that is, .63—that accelerates the time to adoption by 7.4%. Considering that we use the inverse of the distance, an increase of one unit represents approximately 1.6 km (or 1 mile). The social influence of those previous adopters living close to the subsequent adopter is significantly stronger than that of those living further away. This significant influence of geographic proximity still holds ($\exp(\beta_{2,2}) = 1.011$, $p < .01$) if all three control variables for the propinquity effect are incorporated into *Model 2*. Although the decrease of the parameter indicates that the propinquity effect explains a considerable part of the effect of geographic proximity, the effect remains substantial. The increase in adoption hazard by 1.1% caused by a mere 1.6-km difference shows that over larger distances, for instance, between cities, differences in geographic proximity yield substantial differences in the strength of social influence. It is important to recall the non-linearity of the effect: whereas a difference of approximately 1.6 km will have a large impact on consumers living closer to each other (e.g., 1 km versus 3 km), the effect becomes smaller with increasing distances (e.g., 150 km versus 152 km). Here, an additional distance of one mile is relatively irrelevant but differences of, for instance, 50 km will have a strong influence on whether or not a recommendation by a previous adopter is followed.

Interestingly, in *Model 3*, the interaction between geographic proximity and tie strength indicates that the effect of geographic proximity is negatively affected by tie strength ($\exp(\beta_{12,3})$ $=.979$, $p < .01$). This finding is highly remarkable in two ways: First, the negative sign of the interaction shows that the effect of geographic proximity is not merely a result of the propinquity effect but instead that geographic proximity leads to stronger social influence independent of the propinquity effect. Second, this finding shows that the effect of geographic proximity increases with decreasing tie strength to previous adopters. In particular, we find that if consumers receive word of a specific product or its features by a previous adopter whom they know less (such as more-remote acquaintances), consumers look for cues about the previous adopter that they can use to assess the product recommendation's suitability to their personal needs and tastes.

Discussion

The analysis in *Study 1* indicates that geographic proximity indeed displays the expected effect on the strength of social influence—even after controlling for the propinquity effect. Most importantly, the results also indicate that the effect of geographic proximity becomes stronger with decreasing tie strength between the previous adopter and the subsequent adopter. Whereas individuals with high tie strength need not necessarily use distance as a cue for homophily to assess the credibility or helpfulness of a recommendation, geographic proximity may work as a cue when ties are weaker because other information is absent. This fact has two important practical implications. First, geographic data are valuable information for companies that go beyond social network information and thus, geographic proximity is not merely a proxy for social proximity, but can be used as an independent construct. Second, the results imply that geographic information is especially useful when social ties are unknown or nonexistent—for example, in many mobile / Internet environments such as online reviews.

Nevertheless, in our study, consumers do know one another (although in many cases only through a weak tie), and social influence does not occur without a direct social tie in the case of adopting a mobile-phone provider.

The purpose of the next study in which individuals are unfamiliar with one another is twofold: *i*) to test, in a controlled environment, a prevalent managerial application of the effect in the context of online reviews and to experimentally rule out social network confounders and *ii*) to demonstrate a causal effect between geographic proximity and strength of social influence mediated by perceived homophily.

Study 2

To examine the causal effect of geographic proximity on social influence and the mediation of perceived homophily, we conduct *Study 2* as a controlled experiment. We choose online reviews as our experimental scenario because they have repeatedly been proven to exert high social influence on consumers' purchase decisions (Chevalier and Mayzlin 2006; Godes and Mayzlin 2004; Naylor, Lamberton, and Norton 2011). Online reviews not only have the advantage of possessing significant managerial relevance but also provide a setting that experimentally excludes potential confounds. In other words, authors and readers of online reviews typically do not know one another, which is why other social network traits such as actual homophily or tie strength play no role in the customer's decision concerning whether to follow a review. Furthermore, there is neither direct communication between the author and the reader of the review nor a (reasonable) chance of future communication that could increase the trustworthiness of a recommendation (Bradner and Mark 2002).

Method

Procedure. To test the causal relationship of geographic proximity and social influence, we conducted a discrete-choice experiment. Specifically, participants were presented a fictitious scenario involving a smartphone application called *surprise-vacations.com*, which they browse to book hotels for their vacations. Next, we introduced blind booking as a special feature of the app, in which the customer can book an unknown hotel at his or her desired destination in exchange for a large discount (analogous to *Hotwire.com*). Nevertheless, the participants were allowed to read hotel reviews and to decide on a hotel based on the reviews. The blind-booking scenario has the advantage of excluding the qualitative, written content of a review as a confounder while maintaining a realistic scenario (we told the participants that all materials that could contain information about the exact hotel were excluded). Thus, the participants were shown a screenshot of the mock app that displayed three hotels and their reviews in a visually similar design to apps of the kind. The participants had to choose one of these hotels for their next vacation at a destination of their choice (see the full scenario in *Appendix 2*).

For each hotel, we displayed star ratings for multiple relevant criteria, a generic reviewer user name, and the date that the review was posted. The last element did not vary but was included to provide a more realistic setting. Most importantly, we also displayed the exact distance to the (fictitious) reviewers using five different distances (1.2 miles, 5.6 miles, 48 miles, 110 miles, and 890 miles). The distances were set such that the analysis covers different geographic areas such as neighborhoods, regions, or states. Given the GPS tracking functionality of smartphones, location-based user information is common in many mobile applications. *Figure 1* shows an example of a choice set for the fictitious app.

>>>See Figure 1, following References<<<

Among the three reviews shown, two were equal with respect to their star ratings (dominant options) but were ostensibly written by users from different geographic locations. Among the participants, we used all possible combinations of two distances from the five distances enumerated above. The third review provided a lower star rating (dominated option) and was displayed to create a more realistic setting in which the choice between two hotels is not obvious.

Additionally, we varied user name, hotel name (A, B, or C), and the order in which the hotels were shown. After choosing the desired hotel, the participants were asked to answer a multi-item 7-point scale with respect to their perceived homophily to two of the review authors (Gershoff, Mukherjee, and Mukhopadhyay 2007).

Participants. Our sample consisted of 606[3] participants from the Unites States recruited online through Amazon Mechanical Turk. The number of participants was chosen based on the experiment having 20 conditions with respect to geographic proximity and order of the hotels

[3] The deviation from the exact number of participants aimed for is because some Amazon Mechanical Turk users took the survey but failed to confirm the completed task on Amazon Mechanical Turk. For this reason, in *Studies 2–4*, we have a few more participants than intended.

and our aim to obtain 30 participants per condition. The mean age was 31 years, and 44% of our participants were female. The distribution of U.S. zip-code regions in our sample matched well with the actual distribution of the population.

Results

The manipulation of the star ratings creating the dominant and dominated options seemed to work well; only 1% of respondents chose the dominated option. Running a conditional logit model, which is the standard regression model for choice data, with hotel choice as the dependent variable and geographic proximity as the choice predictor also reveals a significant effect by geographic proximity on hotel choice ($\beta = .97$; $z = 10.59$; $p < .01$), with a model fit of pseudo-$R^2 = .15$. Furthermore, if the choice of hotel did not depend upon geographic proximity to the review author, we would expect a random choice of 50% share for each of the two dominant options. However, analyzing all of the choices independent of the specific combination of distances reveals that 72% of the participants picked the hotel reviewed by the user that was geographically closer. Thus, the actual choice is significantly different from being equally split between the close and the distant reviews ($F (1, 605) = 151.26$; $p < .01$). A binomial test for the share of the close hotel also yields a significant difference ($p < .01$) from .5. Additionally, we test how the choice of the geographically close review is affected by response latency by using a one-standard-deviation difference from the mean to indicate low and high outliers (Ratcliff 1993). In this respect, the results are robust toward outliers because excluding outliers only slightly alters the share of those who chose the geographically closer review (74% compared with 72%, including outliers).

Analyzing the possible combinations of distance between the two dominant options separately shows that the effect is surprisingly independent of the actual combination of distances displayed. It is sufficient that a review author lives geographically closer than the other review author. Thus, the effect of geographic proximity seems to be relative and is not limited to a specific area or range of miles.

Because geographic proximity was shown to affect the strength of social influence in online reviews, we additionally test how the role of geographic proximity relates to perceived homophily (Judd, Kenny, and McClelland 2001). Using a 7-point scale, we indeed find a significant difference ($F (1, 605) = 96.23$; $p < .01$) between the perceived homophily to the geographically close user ($M = 4.86$; $SD = 1.03$) and the perceived homophily to the more distant reviewer (M = 4.45; SD = 1.05). This finding holds true for each combination of two distances when measured separately. Running the conditional logit model with geographic proximity and homophily as choice predictors allows us to statistically test the mediation effect of homophily between geographic proximity and hotel choice (Sobel 1982). The analysis indicates a significant mediation (z = 5.05; $p < .01$) of homophily between geographic proximity and hotel choice. Additionally, we test the mediation running bootstrap analysis (1,000 samples), which also yields a significant indirect effect of proximity on choice via homophily ($\beta = .15$; SE = .036; 95% CI = .084; .222).

Discussion

Study 2 demonstrates that if two individuals are geographically closer to one another, their social influence on one another is stronger compared with that of more geographically distant individuals regardless of the geographic distances compared in the analysis. Short distances, for example, can refer to a neighborhood or city, whereas longer distances can indicate a region or state; the results, however, do not change with respect to which two distances are compared. Furthermore, the results indicate that the greater influence of geographically close reviews is mediated by perceived homophily. That is, geographically close individuals are believed to be more similar, leading to those individuals having a stronger social influence on the subject. These findings corroborate the results from *Study 1* by replicating the role of geographic proximity on strangers and extend *Study 1*'s results by demonstrating the mediation of perceived homophily.

In *Studies 1* and *2*, we show that social influence is stronger in geographic proximity through an increase in homophily, whether actual or merely perceived. However, it remains uncertain from previous studies how much value the stronger social influence from geographically close customers has for consumers and the managerial relevance of the findings. In other words, is the increase in strength of social influence sufficiently large that consumers would be willing to pay for it? If so, firms could monetize this effect by ordering reviews accordingly. *Study 3* is designed both to address this question and to test the monetary value of a geographically close review.

Study 3

As the previous studies show, stronger social influence is a result of higher perceived homophily to geographically close consumers. Feeling more similar to recommenders increases the recipients' trust that the reviewed product suits their needs and that they will be satisfied with their choice (Schmitt, Skiera, and Van den Bulte 2011). Thus, a geographically close recommendation serves consumers' need to reduce the uncertainty in their purchase-decision process (Murray 1991). As a result, consumers might actually have a willingness to pay (WTP) more for products that are reviewed by a geographically close person in return for less uncertainty and higher trust in the recommendation.

Method

Procedure. To examine whether consumers have a greater WTP for a product reviewed by a geographically close customer, we altered the choice experiment from *Study 2* by adding prices to the hotels in the *surprise-vacations.com* mobile app display. We retained the previous experimental setting to make the results comparable. Additionally, discrete-choice experiments are shown to be highly suitable for analyzing customers' WTP because of the forced tradeoff (Kostyra et al. 2015). As in *Study 2,* participants observed a choice set of hotels at the same destination, with one hotel ostensibly reviewed by a user living 1.2 miles away and another hotel (with the same star ratings) ostensibly reviewed by a user living 890 miles away. Again, we included a dominated option with worse ratings than the two dominant options. Given the results from *Study 2*, which showed that the effect of geographic proximity was independent of the concrete combination of distances, the distances were not varied further. To test WTP and whether participants would still choose the geographically close option despite a higher price, we added price tags to the hotels. Although we varied the price of the hotel reviewed by a geographically distant user between $79 and $99, the prices for the hotel with the review in geographic proximity ($99) and the dominated option ($109) were kept constant. Specifically, we tested prices of $79, $89, and $91-$99 (in steps of two dollars) and varied the generic username and order of the hotels. Thus, each participant picked a hotel from the choice set and then indicated how similar they perceived the reviewers to be to them, as in *Study 2*. Additionally, we measured the effect of the prices in a control group in which the price difference between the two dominant options was varied accordingly but no information about the location of the reviewer was displayed, thus allowing us to compare how many participants would choose the more expensive hotel in the cases of both knowing and not knowing the reviewer's location. Given that participants must make the tradeoff between lower prices and reviews from someone close to them, the experimental setup allows us to examine the extent to which consumers are willing to pay for the 'product feature' of a close review.

Participants. We ran the experiment on Amazon Mechanical Turk using 817 participants from the United States. The number of participants was again chosen based on 27 different conditions with respect to prices and order of hotels, and we aimed to collect at least 30 participants per condition. The mean age of our sample was 34 years, and 42% of the participants were female.

Results

The condition with equal prices, in which both the hotel with a close review and the hotel with a distant review cost $99, replicates our findings from *Study 2;* 79% of the participants chose the hotel with the close review compared with 21% who chose the distant review. Thus, the close review received a significantly higher share than did the distant review ($F(1, 51) = 25.44$; $p < .01$). Again, the dominated hotel was chosen by fewer than 1%. Moreover, the perceived homophily is significantly higher ($F(1, 51) = 10.29$; $p < .01$) for the geographically close user ($M = 4.56$; $SD = 1.19$) than for the distant one ($M = 3.99$; $SD = 1.12$). The finding on higher homophily to the geographically close user holds across all price conditions.

With respect to the share of choice for the more expensive hotel, we expect a clear pattern if there is no information on the reviewers' locations (see dashed line in *Figure 2*). As one would expect intuitively, the line drops in a steep decline with a few-dollar price difference and remains at a low level of approximately 10%.

>>>See Figure 2, following References<<<

The solid line in *Figure 2,* however, shows how the share for the more expensive hotel develops when it includes a review by someone who is geographically close. Specifically, the results show that the share of participants who chose the more expensive hotel with a geographically close review does not decline as steeply as the line of the control group. That is, the substantial difference between the two lines shows the uplift caused by a geographically close review and can be interpreted as a WTP for having the hotel recommended by someone geographically close. Up to an 8% price difference ($8), the share of the close review remains approximately 50%. Surprisingly, even at price differences of 10%, there remains a substantial share of participants who would rather choose the hotel reviewed by someone living geographically close than take the equally rated, cheaper option. At a 20% difference ($20), the share received by the distant review is equivalent to the share received by the close review in the equal price condition (approximately 70%). Thus, the social influence resulting merely from geographic proximity is so strong that consumers are willing to pay for it and to accept higher prices for their decrease in uncertainty.

Furthermore, we examine how WTP develops dependent on the level of perceived homophily to relate the finding to our theoretical argument. To do so, we run a regression of the price difference of the expensive hotel with a distant review together with the difference in homophily between the close and the distant reviewer on the choice of the more expensive hotel. The results indicate that price difference obviously has a negative effect ($z = -4.37$; $p < .01$) and that the difference in homophily positively affects the choice of the more expensive hotel ($z = 6.34$; $p < .01$). More interestingly, we also find a significant positive interaction of price and homophily ($z = 1.99$; $p < .05$), which shows that the negative effect of the price is weaker as the perceived homophily to the close reviewer increases compared with the distant reviewer. Thus, in line with our theoretical argumentation, the WTP for the close review increases with the effect of geographic proximity on perceived homophily. This result further supports the previous results concerning the role of homophily as a mediator between geographic proximity and strength of social influence.

Discussion

Given that consumers accept higher prices for a product reviewed by a geographically close customer, the results from *Study 3* demonstrate that the effect of geographic proximity found in *Studies 1* and *2* has highly relevant managerial implications. Thus, geographic proximity has an important effect on consumers, as indicated by both WTP and the strength and robustness of the effect. Moreover, *Study 3* reaffirms the mediation of perceived homophily. Not only do the results hold across all price levels but also we see that homophily influences WTP, which additionally demonstrates why consumers are willing to accept higher prices.

Study 4

The findings from *Studies 1–3* yield strong indications that social influence is indeed stronger when the recommender is located geographically closer. In the preceding studies, we use a direct measure of geographic proximity, either derived from the actual distance in kilometers between consumers (*Study 1*) or displayed as the distance in miles to an online reviewer (*Studies 2–3*). However, in cases in which information on the exact locations and distances of both parties is unavailable, most review-based websites (e.g., *Expedia*, *TripAdvisor*, or *Yelp*) provide information about the actual location of the reviewer. Consequently, *Study 4* serves two purposes: first, to test whether the effect of geographic proximity on social influence holds if we display locations instead of distances to test its external validity and second, to examine the relationship between geographic proximity and homophily further by testing the role of social identity theory. Specifically, we seek to understand the mediation more deeply by exploring its boundary condition.

Method

Procedure. In *Study 4*, we also conducted a discrete-choice experiment. At the beginning of the experiment, the participants were asked to indicate their demographics and the state in which they lived, which we used to determine the geographic locations of the participants. Thereafter, they were shown the same scenario as in *Studies 2* and *3* with respect to "blind-booking" hotels. To test an alternative setting, we introduced the fictitious service *surprise-vacations.com* as a website instead of a smartphone application.

On the subsequent page, participants were presented with reviews from three different hotels at their desired destination; they were required to choose one for their next vacation. For each hotel, the participants observed star ratings for multiple criteria, a blurred review text, a generic username, and the U.S. state in which the reviewer lived (see *Figure 3* for an example). To create a realistic setting, we displayed a written review text as commonly found on review websites but blurred the text to exclude the written content as confounder. The participants were told that the review texts were blurred because they could contain information that revealed the exact hotel. The states in which the reviewers lived were presented such that one review was ostensibly written by a user living in the same state as the participant, and two reviews were ostensibly written by users from two randomly chosen states other than the participant's home state. Again, two hotels had equal star ratings (dominant options) and one hotel had inferior star ratings. The order of the hotels (A, B, C), the displayed user names, and the blurred text were randomized.

>>>See Figure 3, following References<<<

After the participants indicated which hotel they would pick for their vacations, we asked them to answer a multi-item 7-point scale with respect to their perceived homophily to the review authors (Gershoff, Mukherjee, and Mukhopadhyay 2007). Furthermore, we asked the participants to indicate on a multi-item 7-point scale the extent to which the state they live in can be considered part of their social identity (Huddy and Khatib 2007)

Participants. Our sample consisted of 511 participants recruited from the United States with the help of Amazon Mechanical Turk. Because the experiment did not have fixed conditions, the number of participants was heuristically chosen such that each U.S. state could potentially appear 10 times (neglecting actual population distribution). The participants had a mean age of 33 years, and 36% were female. The participants were from every U.S. region, and the distribution of the participants' states corresponded well to the actual distribution of the population.

Results

Again, the manipulation of the star ratings worked because only .6% of the respondents picked the dominated option, namely, the hotel that had the worst ratings. As before, we analyzed the effect of geographic proximity by running a conditional logit model that indicated a significant influence of geographic location ($\beta = 1.31$; $z = 12.07$ $p < .01$) on the choice between the same-state review and the distant-state review (pseudo-$R^2 = .25$). We find that the choice between the dominant options, one of which was a review by a user from the same state as the participant and the other which was a review by a user from a different state, was again far from random. Among the participants, 78.3% chose the hotel reviewed by a user from the same state and only 21.1% picked the hotel reviewed by a user from a distant state. Given that a random choice would again yield a 50% share for each of the dominant options, the geographically proximate review received a share that is significantly higher than that received by the distant review ($F(1, 510) = 249.45$; $p < .01$) and significantly greater than 50% ($p < .01$). Interestingly, the share of the hotel with a close review is very similar to that found in *Study 2*, in which the geographically close option received a 72% share. Again, the results are robust with respect to outliers in response latency (Ratcliff 1993). After excluding outliers analogous to *Study 2*, 78.5% of participants chose the hotel reviewed by a user from the same state. Thus, geographic proximity displayed as the true location and not as metric distance also significantly increases the strength of social influence via online reviews.

With respect to the perceived homophily to the review authors, we also find a significantly higher perceived homophily (F (1, 510) = 213.24; $p < .01$) with users from the home state (M = 4.91; SD = 1.09) than with users from a distant state (M = 4.09; SD = 1.09). The findings also show a significant mediation of homophily on the effect between geographic proximity and word-of-mouth influence (z = 4.88; $p < .01$). Again, mediation running bootstrap analysis (1000 samples) yields a significant indirect effect of proximity on choice via homophily (β = .39; SE = .073; 95% CI = .247; .535). Thus, geographic proximity also leads to stronger social influence mediated by homophily if locations instead of exact distances in miles are displayed.

To explain potential differences in the level of perceived homophily and to obtain a deeper understanding of the relationship between geographic proximity and perceived homophily, we also examine moderating conditions. As elaborated in the theoretical section, social identity theory explains why geographic proximity might induce a feeling of homophily (Ren, Kraut, and Kiesler 2007; Tajfel and Turner 1986). By displaying actual locations (states) instead of geographic ranges in miles, the experimental setting in *Study 4* allows the role of social identity to be analyzed. Thus, in the experiment we asked the respondents to indicate on a multi-item 7-point scale (adapted from Huddy and Khatib, 2007) the extent to which they consider their state to be part of their social identity.

>>>See Figure 4, following References<<<

The graphs in *Figure 4* show how the relationship between geographic proximity and homophily is affected by the extent to which people consider their state to be part of their social identity. The strength of the effect of geographic proximity is revealed in the difference in perceived homophily between the close and the distant state. The results clearly indicate that the extent to which one considers one's geographic region part of one's social identity is associated with perceiving people from the same region as being more similar to oneself. At low levels of social identity, there is no significant difference between the perceived homophily to the geographically close reviewer and the perceived homophily to the geographically distant reviewer, whereas there is a significant difference at high levels of social identity. The significance of the moderation is further confirmed by regressing the level of social identity on the difference in perceived homophily to the close and the distant reviewer (Judd, Kenny, and McClelland 2001). The results display a significant influence of social identity (β = .229; t =

7.22; $p < .01$) on the difference between the perceived homophily to the geographically close reviewer and the perceived homophily to the geographically distant reviewer. To further explore the interaction, we use spotlight analysis (Spiller et al. 2013) and examine the slope of the difference in similarity at an average level of social identity and one standard deviation below and above the mean. The results show that the slope is considerably steeper at higher levels such as the mean ($\beta = .813$; $t = 15.32$; $p < .01$) and one SD above the mean ($\beta = 1.197$; $t = 15.94$; $p < .01$) than at levels of one SD below the mean ($\beta = .429$; $t = 5.72$; $p < .01$). In this respect, the increasing difference in perceived homophily is a result of increasing perceived homophily to the close state with higher social identity, whereas the perceived homophily to distant states does not change. This result not only shows the influence of social identity but also supports the view that differences in perceived homophily to the reviewers are actually caused by differences in geographic proximity.

Discussion

The results from *Study 4* replicate and extend the findings from *Studies 1* and *2*. We find that social influence from geographically closer senders is equally strong whether the distance or an actual location is displayed. Considering that this information even be gathered (e.g., by asking Internet users or by using IP address) more easily than tracking GPS data, this finding is highly relevant to ensure the managerial application of our results for many marketers. Furthermore, *Study 4* also confirms that the effect of geographic proximity is mediated by higher perceived homophily to the recommendation sender. To obtain a deeper understanding of the mediation of homophily, we examine why this phenomenon occurs. In this respect, the effect of geographic proximity on perceived homophily is shown to be stronger with an increased consideration of the geographic area (in this case, the state) as part of one's social identity.

General Discussion

Considering the increasing importance of social influence to purchase decisions and the growing use of geographic data for marketing purposes, this study contributes to marketing theory and practice with several important insights into how geographic proximity and social influence are interconnected. Specifically, the results of four studies demonstrate that *i*) geographic proximity leads to stronger social influence even when controlling for the propinquity effect, ii) the effect of geographic proximity strengthens as the tie strength to the sender of a recommendation weakens, iii) consumers are willing to accept higher prices for products reviewed by a geographically close customer, iv) the effect of geographic proximity is mediated by perceived homophily, and v) we show the boundary condition for the effect, namely, the low influence of a geographic area on one's social identity.

Managerial implications

The results from our four studies also yield important implications to help companies actively manage social influence between consumers using geographic information.

First, our finding that geographic proximity leads to stronger social influence has its most obvious application in the context of electronic and mobile commerce. Given that consumers seem to rely more heavily on and consider more helpful the recommendations of geographically close consumers, companies could sort reviews so that those from geographically close users are displayed first. Because the geographic locations of online and mobile prospects can easily be tracked (e.g., with the help of cookies or GPS tracking on smartphones), this strategy could be easily implemented on a technical level and it would lead to more-helpful recommendations. Thus, reviews would not be displayed in the same order for every user (e.g., first listing those rated most helpful by other users); instead, helpfulness would be considered individually different depending on geographic location. By implementing such an individually tailored review order, consumers can be led to conversion more effectively and customers will have a greater ability to find products that suit their needs.

Second, given that consumers are willing to accept higher prices for products reviewed by a geographically close person, sorting reviews according to geographic proximity could also have a large effect on the conversion rates of online shops and other web services.

Finally, companies can utilize our insights in the fast-growing industry of social network advertising to increase the effectiveness of ads. In online social networks such as *Facebook*, *Google+*, or *Twitter*, users' geographic location is typically available and can be used to target social ads, i.e., ads that show Internet users the products or services that their contacts like, follow, or use. Our results imply that advertising with contacts that live in geographic proximity to the user (e.g., "John Doe likes Company XYZ") is more influential than advertising with someone geographically distant. In this context, it is highly relevant that the higher influence of geographic proximity works in both the presence and absence of actual social ties. In other words, companies such as location-based services need not necessarily possess a large amount of information on the actual relationship or tie strength between two consumers, which is often not available to companies. Instead, geographic proximity can be used as a proxy that induces feelings of homophily between consumers, a particularly interesting phenomenon with respect to the increasing number of location-based services and smartphone applications that extensively use geographic data but do not possess direct social network information of consumers.

Theoretical implications

The findings in this article yield several contributions for marketing research because they extend the previous literature in several ways. First, this article extends previous studies on the effect of geographic proximity (e.g., Barrot et al. 2008; Bell and Song 2007; Garber et al. 2004; Strang and Tuma 1993) by explicitly incorporating social network data into the analysis. By doing so, we not only show that geographic proximity actually matters to the strength of social influence but also examine the social network mechanisms that explain when and why it matters. Specifically, this study shows that the influence of geographic proximity is not merely a result of propinquity (Festinger 1963; Mok, Wellman, and Carrasco 2010; Preciado et al. 2011). Instead, we contribute to the existing literature by showing that the effect of geographic proximity holds independent of the propinquity effect and indeed, it increases as ties weaken.

We further contribute to the literature by showing that geographic proximity increases the strength of social influence even in the complete absence of a social tie. In this respect, our findings demonstrate experimentally that geographic proximity leads to higher perceived homophily, which in turn leads to stronger social influence. That is, consumers use geographic proximity as a cue for homophily to assess whether they should follow a recommendation. As we show, this effect is sufficiently strong that consumers are willing to accept higher prices for having uncertainty reduced by geographic proximity. These findings not only are relevant to the literature on geographic proximity but also extend the literature on homophily both by including a geographic dimension and by showing the relationship between homophily and geographic location as part of consumers' social identity.

Furthermore, the results show that the effect of geographic proximity can be considered a relative one. That is, social influence is stronger from a sender who is geographically closer than from a sender who is geographically more distant—regardless of the absolute distances or geographic ranges of the two senders. This effect is an important extension to the existing literature studying the effect of geographic proximity on social influence and word-of-mouth.

Thus far, research has primarily considered the importance of individuals living close to one another, which facilitates social influence between them because of the likelihood of communication. However, it is not only the absolute level of geographic proximity that matters; relatively more proximate consumers also have stronger social influence. Speaking in absolute terms, individuals living very close to one another can experience a double reinforcing effect through the higher likelihood and strength of the social influence between them.

Finally, we analyze conditions under which the effect of geographic proximity becomes larger or smaller. Specifically, we show that decreasing tie strength leads to an increasing effect of geographic proximity, which emphasizes that geographic proximity itself is employed to evaluate and assess a recommendation and determine whether it should be followed. Additionally, we examine the boundary condition of the effect and analyze the relationship of social identity and the reported mediation of perceived homophily. In this respect, we observe that the effect of geographic proximity on perceived homophily can be significantly weakened if the geographic area (in our case, the state) is only slightly considered as part of one's social identity.

Limitations and avenues for future research

We acknowledge that our research is not without limitations that yield promising avenues for future research. First, we examine the effect of geographic proximity and the mediation of homophily using two products: a mobile provider and hotels. Both products are services for which word-of-mouth is typically more important because of the inability to try them before purchase (Murray 1991). Thus, personal experiences by others are very valuable, particularly for hotels, whose evaluation depends upon consumers' specific tastes. Future research could pursue extending our findings to other product categories such as goods or services that are fully assessed using objective criteria.

Second, *Studies 2–4* show that online reviews by geographically close users are more influential and customers are willing to accept higher prices for them. In our analyses, we use experimental designs to demonstrate the effect of geographic proximity on social influence by excluding potential confounders to ensure high internal validity. Given that the review authors' location is one driver of social influence among others, it therefore could be interesting in future studies to analyze the importance of geographic proximity relative to other drivers of social influence and the interplay of geographic proximity with other review traits such as written review content or other personal information. Adding more traits than mere distance could additionally help rule out potential demand effects that might be created by the design of our experiments.

Finally, we study the effect of geographic proximity in two countries (a large European country and the U.S.) that differ with respect to average spatial distances between cities or regions but are culturally relatively similar (Hofstede 2001). Thus, an interesting avenue for further research could be to study how the role of geographic proximity differs between countries, either for geographic or for cultural reasons.

Appendices

Appendix 1

Diagnostic measures of multicollinearity

Variable	VIF	Tolerance	R^2
1. Exposure	3.76	.27	.73
2. GeographicProximity	3.98	.25	.75
3. NetworkOverlap	1.95	.51	.49
4. TieStrength	1.64	.61	.39
5. Household	1.87	.54	.46
6. Age	1.06	.95	.05
7. Gender	1.01	.99	.01
8. Network Degree	1.14	.88	.12
9. LocalPenetration	1.04	.96	.04
10. PurchasingPower	1.00	1.00	.00
11. Advertising	1.01	.99	.01

Note: N=509,191

Appendix 2

Scenario details of Studies 2-4

"Imagine that you are browsing on your smartphone to book hotels for your next vacations at a destination of your choice. For this, you are using a mobile app that is called *surprise-vacations.com.* The app offers hotels via "blind booking" (similar to hotwire.com). This means that you do not know the name of the hotel before booking, but you receive high discounts on your hotel stay.

Imagine that in the booking process you have indicated a category (e.g., 4 stars) and your desired destination. Afterwards, the app shows you a set of different hotels that you can choose from. All information are hidden that would allow you to infer the name of the hotel.

In the following, you are shown the set of hotels and you are asked to indicate which hotel you would most likely choose for your next vacations."

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Tables and Figures

Table 1

Operationalization of variables

Variable	**Operationalization**
1. $Exposure_{it}$	Σ previous adopters *j* in *i*'s social network up to month t
2. $GeographicProximity_{it}$	Σ_j (1/1+distance in km between *i* and *j*)
3. $NetworkOverlap_{it}$	Σ_j (# joint social ties of *ij* / # social ties of *i* + # social ties of *j*)
4. $TieStrength_{it}$	Σ_j (communication volume *ij* / communication volume *i*)
5. $Household_{it}$	1 = *i* and *j* share same zip code and same last name
6. Age_i	Prospect *i*'s age in years
7. $Gender_i$	Prospect *i*'s gender (1=female)
8. $NetworkDegree_i$	Number of social ties in *i*'s social network
9. $LocalPenetration_{it}$	Σ previous adopters in *i* 's zip code per 1000 inhabitants up to month t
10. $PurchasingPower_i$	Purchasing power (in €) in *i*'s zip code
11. $Advertising_{it}$	Provider's advertising spend (in €) in *i*'s zip code in month *t*

Table 2

Descriptive measures and correlations

Variable	Mean	SD	Mdn.	Min	Max	Skew	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. $Exposure_{it}$	.50	.84	0	0	60	3.06	1.00									
2. $GeographicProximity_{it}$	.31	.63	0	0	15	2.78	.80	1.00								
3. $NetworkOverlap_{it}$	.04	.11	0	0	3.42	5.59	.68	.63	1.00							
4. $TieStrength_{it}$	.07	.18	0	0	1	3.07	.53	.48	.38	1.00						
5. $Household_{it}$	.13	.34	0	0	1	2.16	.48	.66	.41	.38	1.00					
6. Age_{i}	41.37	13.73	42	11	108	.314	−.07	−.03	−.02	.02	.04	1.00				
7. $Gender_{i}$	.42	.49	0	0	1	.330	.07	.06	.05	.08	.05	−.04	1.00			
8. $NetworkDegree_{i}$	29.45	32.99	21	0	1924	8.29	.16	.06	.05	−.07	−.02	−.20	−.02	1.00		
9. $LocalPenetration_{it}$	3.59	3.12	3.37	0.17	284.77	16.80	.10	.08	.06	.06	.03	−.04	.01	−.12	1.00	
10. $PurchasingPower_{i}$	16.74	2.62	16.68	8.95	36.47	.49	−.03	−.03	−.02	−.02	−.01	.03	.01	.00	−.01	1.00
11. $Advertising_{it}$	7.20	5.27	5.48	1.49	56.99	2.34	.01	.00	.00	−.01	−.01	.00	−.01	.01	−.01	.02

Note: N=509,191; time-varying variables measured at time of adoption; diagnostic measures of multicollinearity are listed in *Appendix 1*.

Table 3

Hazard regression results on the strength of adoption drivers

		Model 1			Model 2			Model 3		
		Hazard Ratio	**S.E.**	**Z score**	**Hazard Ratio**	**S.E.**	**Z score**	**Hazard Ratio**	**S.E.**	**Z score**
$Exposure_{it}$	β_1	1.138	.0013	115.61	1.133	.0015	93.65	1.121	.0018	69.36
$GeographicProximity_{it}^{*}$	β_2	1.074	.0009	85.04	1.011	.0014	7.80	1.057	.0017	35.27
$NetworkOverlap_{it}^{*}$	β_3				1.021	.0010	21.19	1.023	.0010	22.70
$TieStrength_{it}^{*}$	β_4				1.045	.0011	42.39	1.089	.0014	67.97
$Household_{it}$	β_5				1.317	.0075	48.20	1.258	.0072	40.40
Age_{i}^{*}	β_6	1.060	.0015	42.24	1.051	.0015	35.59	1.054	.0015	37.64
$Gender_{i}$	β_7	.976	.0028	−8.45	.966	.0028	−12.11	.963	.0027	−13.13
$NetworkDegree_{i}^{*}$	β_8	1.060	.0004	156.99	1.061	.0004	165.70	1.061	.0004	162.57
$LocalPenetration_{it}^{*}$	β_9	1.013	.0008	15.66	1.014	.0008	17.64	1.014	.0008	17.02
$PurchasingPower_{i}^{*}$	β_{10}	1.017	.0014	12.10	1.016	.0014	11.08	1.016	.0014	11.40
$Advertising_{it}^{*}$	β_{11}	1.021	.0032	6.56	1.021	.0032	6.51	1.021	.0032	6.65
$GeographicProximity_{it}$ x $TieStrength_{i}$	β_{12}							.979	.0004	−51.35
Likelihood-Ratio χ^2		38,422			44,093			47,006		
Log-Likelihood		−6,221,236			−6,218,400			−6,216,943		

Note: * Variables are standardized to have mean of 0 and standard deviation of 1; N = 509,191.

Figure 1

Example of choice set in blind booking mobile app

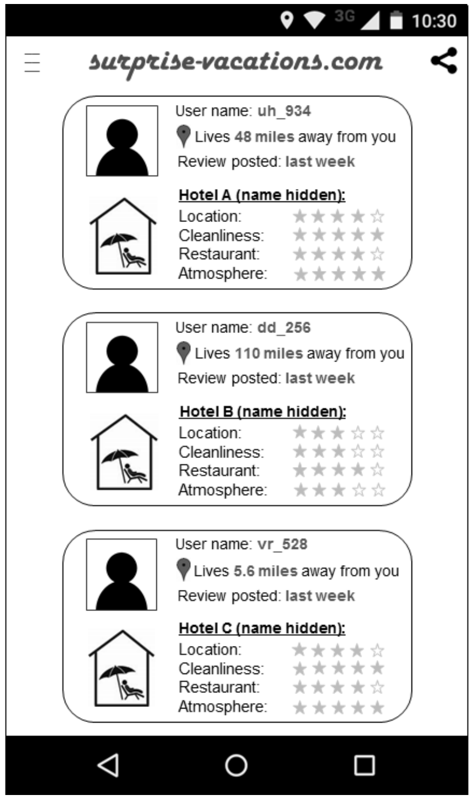


Figure 2

Choice of more expensive hotel with and without close review
depending on price difference

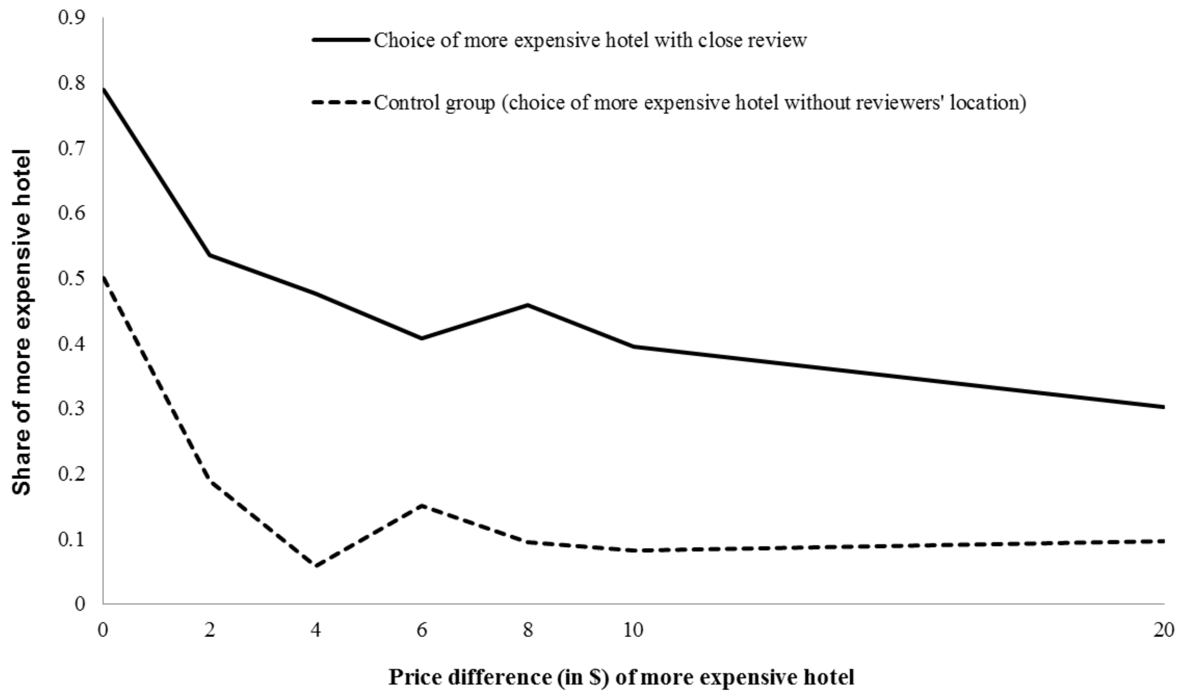
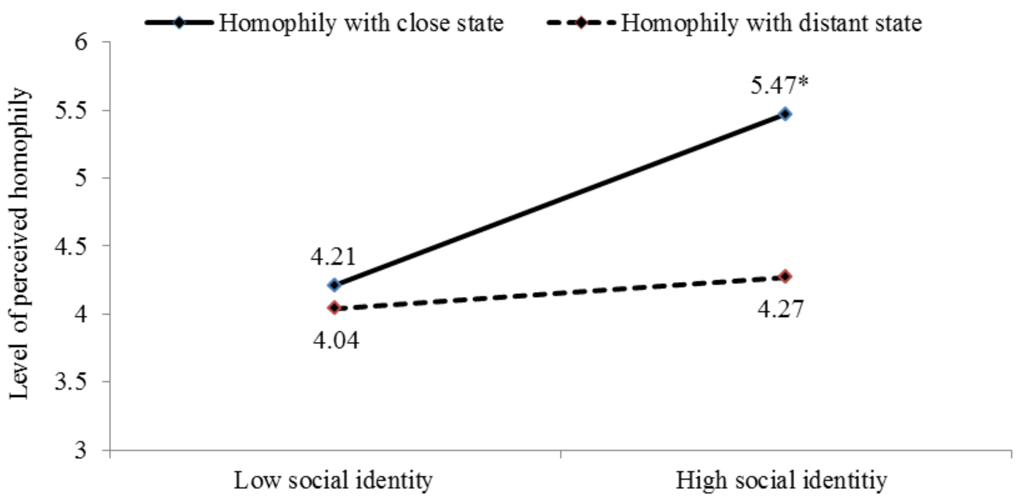


Figure 3

Example of choice set on blind booking website

Figure 4
Moderation of social identity on the influence of
geographic proximity on homophily



Note: * significant difference to homophily with distant state at level p< .01; low social identity refers to values less than / greater than one standard deviation below / above the mean on the 7-point multi-item scale on social identity