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A Tie-Centered Approach for Ego-centric social network studies

By

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A dissertation submitted in partial satisfaction of the

requirements for the degree of

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in

Sociology

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of the

University of California, Berkeley

Committee in charge:

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## Abstract

### Tie centered Approach for ego-centric network research

By

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Along with the development of multi-level statistical models, the dyadic social relationship has been getting attention again in the current quantitative ego-centric social network studies. While many empirical studies have demonstrated distinctive pathways of tie-level dynamics, the dominant way of operationalizing observed social ties often ignores the heterogeneity of dyadic relationships within a given relationship category. Instead, many of social relationship categories such as friends, confidants or social support relationships has been often treated as if each category represents a homogeneous social relationship. Yet, each term of social relationships in effect covers a various range of social relationships. The main goal of this dissertation is to reveal heterogeneous types of social relationships within a given relationship category and incorporate them into empirical examination on the association among social relationships, life course, and mental health status.

In this dissertation, I propose a tie-centered approach as an alternative way of studying ego-centric social networks. The social tie is a complex entity. Within a single dyadic relationship, many relational attributes, contexts, and histories are intertwined. Accordingly, the term “friend,” “confidant,” or “social supporter” can be used in many different senses. In order to understand the multiple forms of a given relationship, the tie-centered approach suggests to inductively create typologies based on the multiple dimensions of any given type of social tie—that is, multiple dimensions of a tie between friends, of a tie between confidants, and so forth. For example, the strength of the relationship (e.g., closeness) can be combined with other variables (e.g., proximity, frequency of contact, length of the relationship, etc.) to form a multidimensional typology. Methodologically, I utilize clustering methods—specifically, a multi-level latent-class model—to investigate how these different attributes of social ties are configured within the hierarchical structure of egos and alters in survey data on personal networks.

Using data from the UC Berkeley Social Network Study (UCNets), a rich source of data on the personal networks of a representative sample of San Francisco Bay Area residents, I apply the tie-centered approach to studying three widely studied social relationships: “Confidant,” “Friend” and “Support relationship.” And I found the heterogeneous subtypes of social relationship within each relationship category: four different types of friends (“the active friend”, “the long-distance friend”, “the longtime-but-not-close friend”, and “the new friend”), four

different types of confidants (“The strong-tie type”, “the companion type”, “the remote type”, and “the acquaintance type confidant”), and six different types of social support exchanges patterns (“the multiple engagements”, “exchanging help and socializing”, “counseling”, “socializing,” “receiving help,” and “providing help”). Further analyses show that over the life course, people have different types of friends, and change support exchanging patterns with their network members. And the different types of confidants have different effects in reducing depression.

The overall implication of my dissertation is that the social relationship cannot be simply interpreted by the general expectation of what a given relationship category would be. Rather, even though some social relationships are described as the same category of social relationship, each dyadic social relationship within the same relationship category has different quality and features from each other. And the varying quality or subtypes of relationships may matter more than the size or structure of their social networks for understanding how social context affects social networks and for estimating the effects of social ties on individuals’ outcomes.

To Soojung  
Word cannot express how grateful I am to have Soojung in my life.

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# Chapter 1

## Introduction

Along with the development of statistical models that can deal with hierarchical data structure, the dyadic social relationship between the ego and alters has increasingly become a central unit of analysis in quantitative ego-centric network research. Many ego-centric social network studies have embarked on research that predicts the characteristics and dynamics of the dyadic relationship. These include whether the relationship is close, difficult, or homogeneous and whether the ego and alters frequently interact with each other. These studies conducted with multi-level modeling have demonstrated varying pathways of tie-level dynamics, which are distinctive from network-level mechanisms. Shifting the focus of study from personal networks to the dyadic relationship brings back the basic question of social relationships: *What is the meaning of a social relationship?*

This is not only the question about the ontological nature of a social relationship, but also meaning of a social relationship is an important practical issue for every empirical ego-centric social network research. In every stage of research practices, this question is a primary issue that research should clearly address. For example, when a researcher makes a simple hypothesis such as “young people will have more friends than older people in their social networks” based on the literature on life course and friendship, what he or she meant by friendship in the particular study context should be clearly defined. In the analysis stage, a researcher may operationalize the friendship network by counting the number of friends in a respondent’s personal network. But this kind of quantification of friendship networks should be implemented after answering whether every friendship in the observed data is similar enough to treat all with equal weight. If the meaning of friendship is not comprehensively defined and its homogeneity is not assured, how can the researcher interpret the meaning of “the number of friends” related to a particular study issue?

Despite the importance of defining social relationships in empirical studies, the meaning of a social relationship seem to be rarely explored within current ego-centric network analysis. Most ego-centric network studies have treated a given category of social relationships (e.g., friendship, discussion partner for an important matter, or emotional support) as if it indicates homogenous social relationships. But what if those terms in effect are ambiguous and cover a wide range of heterogeneous social relationships? This suspicion about the clarity and homogeneity of categories of social relationships raises a set of new questions regarding the past findings in ego-centric network studies. First, previous studies demonstrated that having core discussion partners prevents people from becoming depressed. But is every confidant similar to each other? And does every confidant help to reduce depression? Second, from the accumulated evidence on life course and friendship, we know that the friendship network changes according to marital status and employment status. But what types of friendships are changed by a change

in marital status and employment status is a question that is rarely answered. Third, social support theories and research have paid less attention to who provides what kind of supports. The question is what types of people provide what types of support. Each paper of this dissertation is a product of my attempt to answer these questions.

This dissertation begins with a study on core discussion partners and the implication about their effects on depression. The confidant tie is arguably one of the most widely studied social relationship. Mutual confiding is an important virtue of a significant social relationship. People feel integrated and get support by discussing their personal matters with their network members. Having confidant ties, therefore, reduces loneliness and depression. The underpinning assumption for the positive influence of confidants on mental health is that people confide their personal matters to intimate and supportive network members. This assumption, however, has been challenged by current seminal studies which showed that people discuss their personal matters with specific types of network members according to the subject matter and accessibility to them. If the confidant network is, in effect, a group of heterogeneous social relationships, then how many different types of confidants can people have? And are all confidant ties equally beneficial in reducing depression? The results of this first paper show that there are four different types of confidant ties. As expected from the conventional view on confidant ties, one group of confidants is an intimate and a supportive social relationship (the strong tie-type). On the opposite end, there are confidants who are neither intimate nor supportive (the acquaintance type). In between the two groups, there are confidants who are emotionally close with but live far apart from the ego (the remote type). The last type of confidant is a group of network members who are emotionally close and frequently socialize with the ego but do not actively exchange help (companion-type). Based on these four types of confidants, two different configurations of confidant networks were found. One type of confidant network is mainly configured with the strong tie-type and acquaintance-type confidants (the divided-type confidant network), whereas the other type of confidant network includes all the four types of confidants (the mixed-type confidant network). Although people with the divided-type of confidant networks have more strong tie-type confidants than others with the mixed-type confidant network, people with divided-type confidant networks are more likely to suffer from depression. These results not only confirm the heterogeneity of confidant relationships but also imply that the positive implication of confidant networks on depression is not merely derived from close and supportive confidant ties. Rather, this result implies that the remote-type and companion-type confidants may play important roles in reducing depression, given the existence of the strong tie-type confidants.

The second paper examines the variation in friendship networks across individuals with different marital and employment statuses. Numerous studies have demonstrated that life transitions related to marriage and employment induce changes in friendship networks. However, empirical results from previous studies are somewhat inconsistent. Some studies found shrinking friendship networks after marriage or entry to the labor market, while other studies found no association between the number of friends and marital or employment status. The inconsistencies may partially stem from the fact that many empirical studies on friendship networks often ignore the heterogeneity of friends. The term “friend” is ambiguous, and it covers multiple forms of social relationships. In this paper, I attempted to categorize the multiple types of friends and test their varying distribution according to respondent's marital and employment status. The results show that friendship ties are classified into four different types of social relationships: active friend, long-distance friend, long-time-not-close friend, and a new friend. The active friend is someone whom a person knows for a long time. This friend is emotionally close and frequently

interacts and exchanges various aid with the person. The long-distance friend is a friend who lives far apart but maintains a strong emotional bond. The long-time-not-close friend is a network member whom a person knows for a long time and with whom the person frequently socializes and exchanges practical help; however, the long-time-not-close friend does not share an emotionally close relationship. The new friend is someone with whom a person has currently developed a friendship, mainly through social activities and exchanges in practical help; however, this friend is not yet emotionally close with the person. The results show that although the number of friends is not significantly different across marital and employment status, the four types of friends are differently distributed across the marital and employment status among the older population (ages 50 to 70). Older people who are married are likely to have more long-time-not-close friends and fewer long-distance and new friends than the older people who are not married have. Like older married people, employed older people have more long-time-not-close friends and fewer long-distance friends and new friends than retired and unemployed elderly. The results imply that the friendship network is composed of multiple subtypes of friends and that the difference in friendship networks by life stage is a consequence of the complex changes in the multiple subtypes of friends.

In the last paper, I analyze how aging changes social exchanges of social ties. Assessing the changes in social interaction due to aging is key to understanding the social integration and well-being of older adults. Although previous empirical research has studied the changes in the various aspects of social networks due to aging, there has been less attention to how aging changes the social exchange patterns of particular social ties. In this paper, I attempt to answer the following two questions: What types of support do older people exchange and with whom? And how do these exchanges change by aging? Distinctive social exchange patterns with alters in personal networks were identified, and changes in social exchange patterns due to aging were examined. Six distinctive patterns of social exchange were found: “multiple engaging” and “exchange help and socializing” involve engaging in multiple exchanges, and “counseling,” “socializing,” “receiving help,” and “providing help” involve one activity. The overall distribution of these six social exchange patterns is relatively stable across age groups. However, the social exchange patterns with certain groups of individuals (“child,” “parent,” “workmate,” and “organization mate”) were different across age groups, whereas the social exchanges patterns with other groups of individuals (“spouse,” “sibling,” “friend,” “neighbor,” and “acquaintance”) remain the same. These findings imply that older adults may fulfill their need to engage in social activities by preserving or altering suitable partners for certain activities under the constraints of their late-life conditions. In conclusion, I suggest that the adjustment of whom they can be with for various activities is one of the key processes through which older adults adapt to the new life conditions associated with aging.

## Chapter 2

# Different discussion partners and their effect on depression

### Introduction

Do people disclose their personal matters to those with whom they feel close and expect support from? Numerous social support network studies have considered this “core discussion network” as a set of intimate and supportive social relationships (Burt 1984; Marsden 1987; McPherson, Smith-Lovin, and Brashears 2006). Accordingly, having fewer confidants in personal networks has been seen as a proxy for social isolation (McPherson, Smith-Lovin, and Brashears 2006; Cornwell, Laumann, and Schumm 2008) and a predictor of lower levels of happiness, higher levels of depression, and an increase in the likelihood of mortality at a younger age (Burt 1987; Gore 1978; Menaghan and Lieberman 1986; Cohen and Wills 1985; Woods 1985; Michael et al 2001; Berkman and Syme 1979). The core theory in this perspective is that people discuss important matters with people that they are close to and who also provide easily available and useful support, which contributes toward the maintenance and improvement of their mental wellness.

However, this underlining assumption on core discussion partners has been challenged by a recent series of studies on core discussion networks. These studies argue that not all discussion partner ties are close and stable social relationships. Rather, how people choose their discussion partners is shaped by the subject discussed, the nature of the relationship, and individual contexts (Bearman and Parigi 2004; Small 2013, 2017). Subsequently, the effect of confidant ties on health outcomes varies according to the subject discussed and the specific help offered (Wellman and Wortley 1990; Perry and Pescosolido 2015).

The current debates on core discussion partners raise two important questions. First, do core discussion partners represent a set of homogenous social relationships (as strong ties) or a set of heterogeneous social relationships? Second, do all core discussion partners contribute to improving an individual’s mental health? In order to answer these questions, first, we need to determine the different types of confidant ties and elucidate their multiple characteristics. Second, how the subtypes of confidant ties are similar or different from each other in terms of their implication on health outcomes needs to be tested. Using rich personal network survey data collected from the San Francisco-Oakland area in 2015, this research demonstrated that there are four different types of confidant ties, and some types of confidant ties are more important in predicting an individual’s level of depression.

### The heterogeneity of core discussion partners

As discussed above, the theories on the relation between confidant ties and mental health are based on the expectation that core discussion partners provide useful resources and support. This expectation is derived from two assumptions. First, it is assumed that core discussion partners would be people who are close, such as kin or friends, with whom people interact frequently and thereby understand the individual's situation (Marsden 1897). Second, core discussion partners are based on strong ties to the extent that this relationship is based on a deep emotional bond, support, mutual understanding, frequent interactions, and the exchange of resources (Granovetter 1973). Subsequently, the number of confidant ties in a personal network would be a proxy for the amount of support an individual has, which in turn, helps to maintain their mental health. Based on these two assumptions, many researchers have hypothesized that a person with a larger number of core discussion partners will have better mental health than individuals with fewer core discussion partners. In general, the results from the accumulated studies have demonstrated a positive association between the number of network members and mental wellness (Burt 1987; Gore 1978; Menaghan and Lieberman 1986; Cohen and Wills 1985; Woods 1985; Michael et al. 2001; Berkman and Syme 1979).

Recently, this set of assumptions has been questioned. First, are most core discussion partners close social relationships? From a series of studies, Small demonstrated that a substantial portion of personal discussion partners is drawn from weak social relationships (2013). For example, in his 2013 study, Small found that 45% of confidant ties consisted of not-close social relationships, such as physicians or co-workers. His main argument was that the choice of discussion partner is based on whether a particular person is available at the time of need and whether they know about the specific discussion issue (Small 2013). Subsequently, sometimes people disclose their personal matters to a not-intimate person if they think that a particular person is available and can provide them with advice.

In other directions, researchers have raised questions about the homogeneous assumption of the importance of the subject matter when selecting discussion partners (Bearman and Parigi 2004; Perry and Pescosolido 2015). These studies contend that the discussion subject, the "important matters," covers a range of issues, and people rely on different discussion partners depending on the subject. For example, Bearman and Parigi found that people do not randomly select discussion partners or rely on a few specific alters for every matter. Rather, their study demonstrates that particular roles are given to specific discussion partners for specific subjects. For example, a spouse is likely to be approached for economic and house-related issues, whereas friends would be partners for discussing community or ideological issues (Bearman and Parigi 2004).

More broadly, other studies have revealed that people purposively mobilize specific resources from particular network members. The main idea is that people selectively chose alters depending on the support and resources they require. Wellman and Wortley demonstrated that most network members were specialized for specific types of support and the type of support depended on the characteristics of the relationship. For example, people tend to receive emotional support from their strong ties or close family members, whereas people tend to rely on alters who lived nearby for issues that require less support (Wellman and Wortely 1990). Receiving different support from different relationships implies that the discussion partners may not be similarly supportive in terms of the type of help they offer.



Critics of the “important matter” networks and assumptions of the core discussion partners commonly contend that the core discussion partners are composed of a heterogeneous group of social relationships in terms of their nature and function.

### **The differentiation of different types of discussion partners.**

When the term “core discussion partner” covers multiple forms of social relationships, a practical challenge is how to differentiate those heterogeneous relationships. A convenient way of discerning the different types of confidant ties may be to add the relationship characteristics, such as kinship or closeness, into categories of confidant ties (e.g., kin-confidant vs. non-kin confidant). However, like other social relationships, confidant relationships are too complex to be comprehensively differentiated with a small number of relational elements.

The relationship with a discussion partner contains multiple characteristics such as the role of the relationship, content of social exchanging, emotional attachment, geographical distances, and so on. In addition, these diverse characteristics within a dyadic relationship, as Granovetter pointed out, intertwine to each other (Granovetter 1973). However, the associations among the multiple elements of the relationship, unlikely what Granovetter expected, are not linear. For example, asking for physical assistance is only possible when alters are geographically reachable, but it does not necessarily require an emotional closeness with these alters. People may not see or hang out with their friends who live far away from their home frequently, but this does not necessarily mean that they are not close friends or communicate infrequently. Intimacy, active interaction, mutual confiding, and exchanging resources and services are important elements that make up the nature of social relationships, but these elements do not necessarily associate with each other enough to be able to measure social relationships linearly based on the strength of the ties.

The multifaceted nature of a dyadic relationship and non-linear interdependency among multiple characteristics can serve to identify the nature of social relationships. For example, Spencer and Pahl determined inductively the different types of friends based on the combination of the multiple characteristics of the friendships (Spencer and Pahl 2006). Their basic idea is that a social tie with the relational characteristics A and B is different to relationships formed with the relational characteristics A and C, or A, B, and C. As an empirical example, they differentiate helpmate type of friends and confidant type of friends. The former type is likely to exchange instrumental help and socialize together. Although people also socialize together with the latter type of friends, the latter type friends are likely to be specialized for confiding activities rather than for exchanging physical help (Spencer and Pahl 2006).

In this sense, the different types of discussion partners can be determined by assessing the combination pattern of the multiple qualities and role relationships of discussion partners. Similar to the general assumptions in conventional studies on core discussion partners, some discussion partners might be emotionally close, geographical reachable, and provide diverse social services. Whereas other confidants might also be emotionally close but are only involved in confiding and socializing activities similar to the confidant friends type in Spencer and Pahl’s study. In Small’s research, some of the confidant ties are non-close alters who may specialize only in confiding activities. These three exemplary types of discussion partners cannot be comprehensively differentiated with a single relationship characteristic or idea on the strength of the ties. First, all three ties can be seen as a similar relationship in the extent to which they are all engaging in a confiding activity. However, the last type of confidant is different from the other

two types in its intimacy and social exchanging behaviors. The first and second types of alters are also not similar to each other to the extent that the second type rarely engages in exchange help, even though both relationships are based on strong emotional closeness. What makes these three types of discussion partner different from each other is the configurational structure of the emotional closeness and exchange content.

In short, the term “core discussion partners” contains a set of heterogeneous social relationships in terms of their nature and supportiveness. In this paper, I argue that the heterotypic confidant relationships can be determined by assessing the combinational pattern of the multiple elements of the relationship. This leads to the first hypothesis of this paper:

*Hypothesis 1: Confidant relationships can be classified into different types of social relationship according to the combinational pattern of their characteristics and the exchange functions of the relationships.*

### **The different configuration of confidant networks**

Choosing whom to talk to about important matters is shaped by the discussion subject matter, the nature of the relationship, and the context where the individuals are embedded (Bearman and Parigi 2004; Small 2017). According to life stage, employment status, gender, economic situation, or personality, the subject of an important matter and available discussion partners within their social networks will vary. For example, Bearman and Parigi’s study demonstrated that matching the important issue to an alter’s role relationship is strongly conditioned by gender and employment status (Bearman and Parigi 2004). For example and not surprisingly, workers have more issues related to their current job and more co-workers in their networks with whom they can rely on for discussing these issues than unemployed individuals.

For alters available for discussing personal matters, whom people chose as discussion partners also depends on who is in their personal networks. As shown in Bearman and Parigi’s study, people tend to choose their spouse or romantic partners for money or housing issues, but this selection is only possible when they are married or in a romantic relationship (Bearman and Parigi 2004). Unmarried people may find possible discussion partners for these issue from among their relatives or friends. Even if the same issues arise and people want to discuss these matters, whom people discuss their issues with depends on the composition of their personal network.

Personal network composition is heterogeneous; some people have more friends than others, and some personal networks are configured with more strong social relationships than other networks. Multiple types of personal network composition have been reported in the many empirical ego-centric network studies (Fiori, Smith, and Antonucci 2007; Litwin 1998; Gerstorf, Smith, and Baltes 2006; Bosworth and Schaie 1997; Youm, Laumann, and Lee 2018). For example, using the Berlin Aging Study, Fiori and her colleagues demonstrate that there are six different types of social networks according to several characteristics of social networks such as size, average contact frequency, and the proportion of kin. Some respondents in their study reported diverse social relationships in their networks, whereas other respondents’ networks are dominated by either kin or non-kin members (Fiori, Smith, and Antonucci 2007). With GSS data, Youm and his colleagues also found multiple types of social network configuration across the course of life. Personal networks mainly composed of family ties are the dominant type for people in their 20s and early 30s. During the middle-aged period, many personal networks are

composed of spouses, friends, and neighbors. At the later stage of life, more than 80% of GSS respondents have friendship- and children-centered network types (Youm, Laumann, and Lee 2018).

People find their discussion partners mainly from their pool of personal relationships. As with discussing important matters, the person chosen to confide in varies according to an individual's life context, and so the pool of social relationships differs according to the context where the individuals are embedded. Thus, the core discussion networks will be configured in multiple ways. People may have more close confidants in their core discussion networks because their close ties have information on the current issue or are easily available. The core discussion networks might also center on non-close social relationships because their current issue might involve conflict with close persons or their close network members are not available. This discussion leads to my second hypothesis:

*Hypothesis 2: There will be different types of confidant network configurations according to the varying distribution of multiple types of confidants.*

### **The different implications for mental health.**

Accumulated evidence in social and medical sciences has demonstrated that confiding important personal matter in others significantly improves an individual's mental and physical health by acting as a buffer against the negative influence from stressful live events (Gore 1978; Menaghan and Lieberman 1986; Cohen and Wills 1985; Woods 1985; Michael et al. 2001; Berkman and Kawachi 2000). People receive emotional support or instrumental help from their confidants, which in turn meets their needs in a stressful situation, or they articulate their problems by discussing them, and this may attenuate their stress from the problem (Smyth et al. 1999). Having confidant ties is better than the absence of confidant relationships for preserving mental health.

However, regarding the heterogeneity of core discussion partners in terms of their nature and function, the question is whether people can receive similar benefits from all discussion partners. Although not many studies have examined the possible varying effects of the different types of confidant ties on health outcomes directly, Perry and Pescosolido's (2015) study demonstrated that not all confidant ties play an important role in promoting an individual's health outcome. Their results suggest that close discussion partners do not improve an individual's mental health and health-related service satisfaction significantly unless the health-related issues are their main discussion subject.

In the same sense, the influence of core discussion networks on health would be different according to their configurational characteristics. The varying effects of the different configurations of social networks on health outcomes have been reported in many previous studies (Litwin 1998; Fiori, Antonucci, and Cortina 2006; Shiovitz-Ezra and Litwin 2012; Fiori and Jager 2012). By mapping out the heterogeneous types of supportive networks using various network variables inductively, these studies have demonstrated that the effects of support networks on mental and physical health vary according to the configurations of the networks. For example, older people with friends centered network types demonstrated the highest level of cognitive function, while depression symptoms were efficiently buffered by family-centered network types (Fiori and Jager 2012). Among the young to middle-aged population, people with networks mainly configured around friends and neighbors without a spouse or family members

demonstrated a lower level of general happiness than people with others types of networks (Youm, Laumann, and Lee 2018).

If the core discussion partners are supportive and intimate social relationships, as expected from the previous assumption, having more discussion partners will be better than having a few confidant ties. However, when there are heterogeneous types of confidants, and an individual's confidant networks are configured in different forms, as expected from this study, a certain type of confidant network composition will be better for reducing depression levels than other types of confidant ties. This leads to the third hypothesis, related to the above two hypotheses:

*Hypothesis 3: If there are different compositions of confidant networks according to the varying distribution of heterogeneous type of confidant ties, a certain type (or types) of confidant network configuration will more successfully attenuate the depression level than other types of confidant networks.*

### **Data and sample**

This study used the University California Berkeley Social network survey data (UCNets). The UCNets surveyed residents in the Bay Area aged between 20 and 30 years old and 50 and 70 years old. The initial participants were drawn from randomly selected households across 30 Bay Area census tracts. The solicitation letter invited participants who met the age criteria of the survey in each household. The first wave of UCNets participants was in 2015, the second wave was in 2017, and the third wave was in 2018. The final respondents in the first wave who completed the survey were 1,159 individuals (674 50-to-70-year-olds and 485 20-to-30-year-olds), and 88% and 83% of the first respondents completed the second and third wave survey, respectively.

One of the unique benefits of the UCNets is its rich information of the networks' members. UCNets creates a name list of the respondents' network members by asking seven name eliciting questions. These seven questions asked the respondents about whom they participated with or expected to participate with in social exchanging activities. Based on the list of alters gathered from the name eliciting questions, the survey asked several name-interpreting questions that described the details of the alters and the relationship they had with them such as emotional closeness, role relationships, homophily in age, gender, race, religion, and geographical distance and so forth.

For the current study, the older group of respondents (50 to 70 years old) who reported at least one discussion partner and their discussion partner from the first wave of the UCNets data were selected. The depression variables were drawn from both the first and the second wave data. Thus, the final case studies in this study are the alters named as a confidant during wave 1, and respondents who completed the wave 1 and 2 surveys and reported at least one confidant in their wave 1 network roster. As illustrated in Table A.1, 448 respondents and 2,557 confidant ties were included in analyses of this study.

### **Variables**

*Confidant:* The confidant ties were defined using two name eliciting questions from the UCNets: “When you have to make important decisions—for example, about taking a job, family issues, or health problems—Whose advice do you or would you seek out?” and “Sometimes

*personal matters come up that concern people, like issues about relationships, important things in their lives, or difficult experiences. Who do you confide in about these sorts of things?"* The term "confidants" in this study refers to a person with whom people receive advice for important decision-making or confiding personal matters. Table A.1 illustrates that the weighted average of the confidant ties in wave 1 is 5.15.

*Tie-level variables:* Six tie-level variables were used that describe the quality of confidant relationships: emotional closeness (especially close or not), geographic proximity (live within one-hour driving distance or not), social companions, expecting help in a major emergency, providing help for practical chores, and receiving help from respondents. These six variables were measured with dichotomous values (i.e., "yes" or "no"). In addition to these variables, five alter attribute variables were used: role relationship (family, extended family, friends, and others), newly met person in the last year ("yes" or "no"), and three homophily variables (same age, same sex, and same race/ethnicity). In the initial survey, the respondents described the role relationship of a particular alter with more than ten categories and were allowed to choose multiple roles. The role relationship was simplified by reducing them into four categories and selecting the main roles. "Family" contained spouse, parents, and children (including step relationship). Siblings, in-law relationship, and other relatives were put into the "extended family" category. "Friends" contained alters who were described as friends without any additional roles. For example, when a respondent defined a certain alter as a co-worker as well as a friend, they were treated as a co-worker. Alters in the "other" category included co-workers, neighbors, acquaintances, or professionals (e.g., physician and landlady).

*Respondent level:* Nine demographic characteristics (age, gender, marital status, race/ethnicity, education level, employment status, household income, residential tenure in the current town, U.S.-born, and general health status), two network variables (number of confidant ties and overall network size), and one personality variable (level of introversion) were also included. These variables were used for profiling the respondent's level of confidant network composition and as control variables in the model for predicting depression levels. The details are described in Table A.1.

*Depression:* Depression in this study was measured using seven depression symptom variables during wave 1 and wave 2 ("*feel irritable or have angry outbursts,*" "*feel restless or fidgety,*" "*feel hopeless,*" "*feel nervous,*" "*feel so depressed,*" "*feel that everything was an effort,*" and "*feel worthless*"). Respondents in the UCNets data indicated how often they experienced a particular depressive symptom during the past 30 days with five-scales from "*All of the time (1)*" to "*None of the time (5)*." The original scales of these variables were reversely coded and summed into a total score of depression (range from 5 to 35). Larger depression variables represent a higher level of depression.

### **Analysis strategy**

The main analytical subjects of this study were as follows: first, determining the different types of confidant ties at the tie level; second, the clustering compositions of confidant networks at the respondent level; and third, examining the effects of different confidant network compositions on depression in wave 2. Accordingly, an overall analysis was conducted with three separated steps using a multi-level latent class analysis. In the first step, the confidant ties based on the association pattern of six relationship variables were clustered, and then the respondents were grouped using the cluster of confidant ties. After fixing the number of classes

of confidant and groups of individuals, as a second step, the tie-level and individual-level covariates were added into the final model selected in the former step, respectively. Using the results from the first and second stage analyses, the classes of confidant ties and groups of the respondent were classified. In the last step, depression in wave 2 was regressed onto the groups of confidant-network composition, controlling for baseline depression (i.e., depression in wave 1) and the other control variables.

There were several practical modeling issues in each stage of the analysis that required a detailed explanation. In the first stage of the analysis, the confidant ties were clustered by implementing the multi-level latent class analysis. As with latent class analysis (LCA), the MLCA classifies the study units (confidant ties in this study) with a pattern of conditional probabilities that indicate a chance of observed discrete variables (six relationship variables in this study) taking on a certain value given the class membership (Lazarsfeld 1950; Goodman 1974; McCutcheon 1987). The practical issue in this stage was that the study units were not independent. As the data in this study has a hierarchical structure in terms of the discussion patterns belonging to the respondents, the confidants belonging to the same individual cannot be treated as independent observations. The dependency of the observations caused a biased estimation of the parameters (Agresti et al. 2000). The MLCA model deals with this dependency of observation by introducing a random coefficient into the model (Vermunt 2003). In the modeling procedure, the explanatory LCA model was run initially without a random coefficient parameter, which determined the optimal number of clusters of the confidant ties. Then, a random coefficient was added into the final model to control the possible biases due to the dependency of the units on the parameter estimates.

However, the parametric approach using random coefficients for capturing group level effects requires a strong distributional assumption that the group level deviation from the average parameter value should be a normal distribution. Further, the effect of random coefficients is not easy to subjectively interpret. Instead of parametric modeling, Vermunt suggests a non-parametric random coefficient approach that models lower-level latent classes and upper-level latent classes simultaneously. The main idea of this approach is to capture group level variances by defining upper-level latent classes based on the distribution of lower-level latent classes. (Vermunt 2003). The benefit of this modeling strategy is not only the lessening of the strong distributional assumptions but also the development of a subjectively interpretable group level latent class. In this study context, this non-parametric approach allows for a grouping of the respondents based on the distributional patterns of the confidant clusters. Each group of respondents can be interpreted as a group of people who have similar types of confidants. So, the individual level latent class can be seen as a distinctive confidant network composition. In the model's process, a series of group level latent class models were conducted based on a given tie-level latent class model excluding the random coefficient parameters and the goodness of fit statistics were compared within those models. Through these comparisons, the final model to represent the optimal number of tie-level and respondent-level clusters was determined.

Another issue was the inclusion of covariate latent class models and conducting models for testing the effects of latent class on a dependent variable. There are two suggested modeling strategies to predict latent class membership with a set of covariates (Bolck, Croon, and Hagenaars 2004) and the effects of latent class. The first is the one-step approach, which estimates the measurement (latent class model) and structural parts (testing covariate or regression of dependent variable on latent class) simultaneously. The problem with the one-step approach is that the class membership of study units may change after adding predictors or a

dependent variable. Instead, the three-step approach suggests separating the estimation process into three parts: estimating the latent classes, assigning the study units to the latent classes according to the modal class membership probability, and then predicting class membership with the covariates or by using the latent class variable as a predictor. This simple three-step procedure is better than the one-step approach to the extent that the latent class estimation is not influenced by the covariates or dependent variables. Yet, the disadvantage is that this separating estimation does not account for the uncertainty of class membership. In the class assignment step (e.g., step 2), the study units are assigned to each class in a deterministic sense (i.e., belong to a certain group or not), even though the estimated class membership from the latent class modeling has a chance of belonging to a certain latent class. Bolck, Croon, and Hagenaars demonstrate that ignoring the probabilistic nature of class membership in the class assignment often underestimates the relationship between the latent class membership and covariates (or a dependent variable). Vermunt suggests the solution to these issues by adding classification probability tables as weight variables into the third step modeling (testing the effects of the covariates on latent class membership or estimating the effects of the latent class on a dependent variable; Vermunt 2010). In this study, models following this corrected three-step analysis process were developed. After determining the tie-level and respondent-level latent groups, the covariates for each level were included into models with the weight variables, and a regression model for testing the effects of the respondent-level clusters on depression was also adjusted in the way suggested by Vermunt.

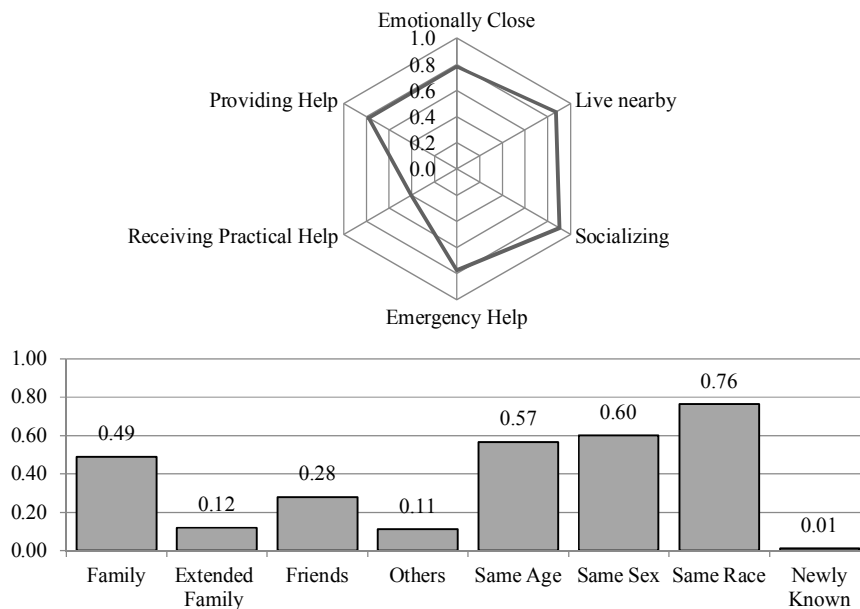
The best model for the latent class analysis section was selected based on Akaike and Bayesian Information Criterion (AIC and BIC), and Group-Based Bayesian Information Criterion (Burnham and Anderson 2004; Lukočienė, Varriale, and Vermunt 2010). Table A.2 illustrates the goodness-of-fit statistics for the series of latent class models. The first five rows (Model 1 to Model 5) in Table A.2 present the goodness of fit statistics of the latent class models that were estimated without a random coefficient. The BIC values of these models illustrate that the four-class solution is better for describing the observed associations of the six relationship variables than other models. Given this solution, the respondent level variance was captured using parametric (Model 6) and nonparametric methods (Model 7 and Model 8). As illustrated in the BIC values of these models, both the parametric and nonparametric specifications of the respondent level effect substantially increased the model fit compared with Model 5. Furthermore, the two group level latent cluster model (Model 7) illustrates the lowest BIC and Group-Based BIC. Subsequently, Model 7 was chosen as the final solution. This model indicates that the confidant ties were classified into four classes, and the respondents were grouped into two clusters based on the distribution of the four confidant classes.

## **Results**

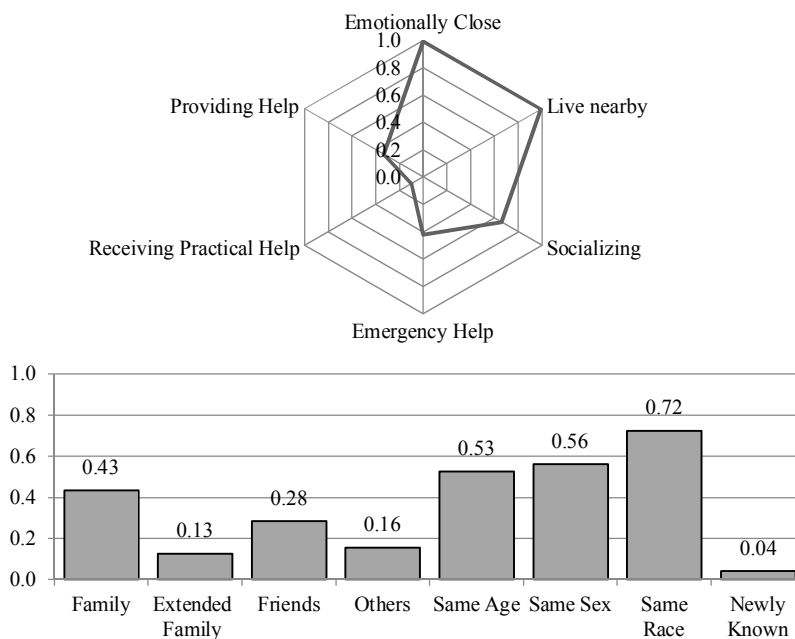
### **The different types of discussion partners**

The results from the final latent class model suggested that the discussion partners can be grouped into four distinctive classes. Using a pattern of conditional probabilities of six tie-level relationship variables illustrated in Table A.4, the four classes were named as *a strong tie-type*, *a companion-type*, *a remote-type*, and *an acquaintance-type confidant*. In addition to the conditional probability, each class was also profiled with the results from the covariates model, which predicts the class membership with the four tie-level covariates (role relationship, same

gender, same race/ethnicity, same age, and newly met or not). The results of this model can be seen in Table A.5. And I also characterized the contents of each latent class with reference the mean probabilities of respondents to tie-level attributes, which illustrated in Table A.6 and Table A.7. The four classes' characteristics are presented in Figures 2.1, 2.2, 2.3, and 2.4, respectively.

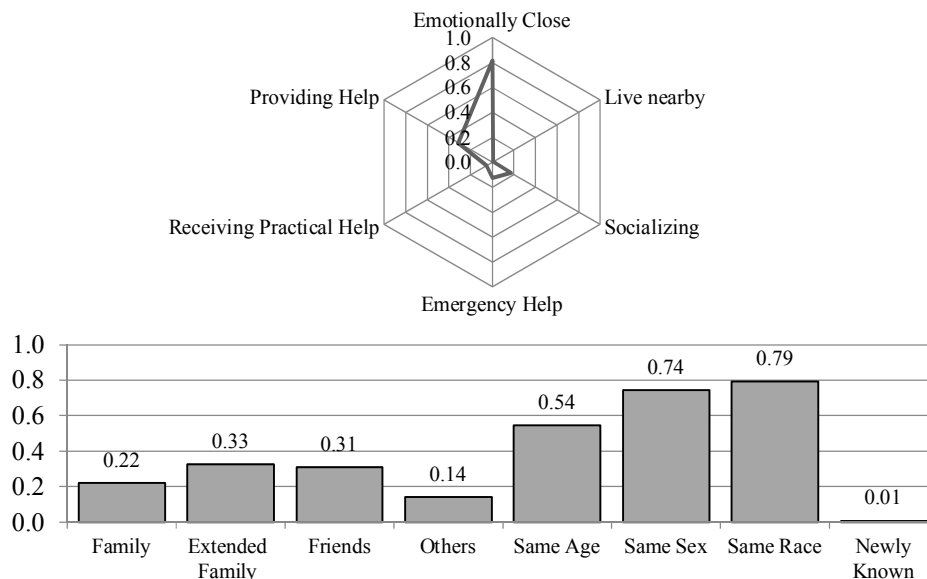


**Figure 2.1. Strong-Tie Type (37.22%)**

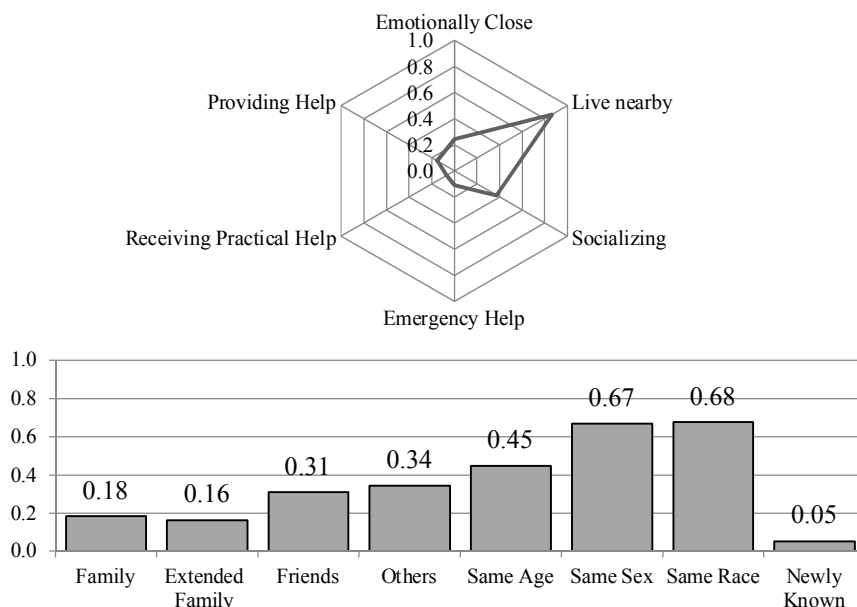


**Figure 2.2. Companion Type (19.11%)**





**Figure 2.3. Remote Type (19.68%)**



**Figure 2.4. Acquaintance Type (24.00%)**

*Strong tie-type confidant:* The discussion partners assigned in this class fit with the conventional expectation of the core discussion partners as a strong and supportive relationship. This type of confidant is emotionally close, geographically reachable, actively exchanges supports, and frequently socializes together with the respondents. Approximately half of the confidants in this group were composed of family members such as spouses, parents, or children, and 28% of the members were friends. The members of this group are likely to be homogenous in terms of gender, race, and age. Referring to these characteristics, this group was labeled as the “strong tie type confidant.” Although the proportion of strong tie type groups among the overall discussion partners was larger than any other type of confidant, this cluster was just over one

third (37.2%). This result implies that people find some of their discussion partners from their strong and supportive social relationships. However, not all discussion partners can be assumed as from supportive and close relationships.

*Companion-type confidant:* The second class of confidants was similar to the strong tie type confidants in several ways. As with the strong tie-type confidants, alters of this class are emotionally close, live nearby, and frequently socialize with respondents, and most of the members of this group are from family members (43%) and friends (28%). In addition, they are likely to be homogenous alters in terms of age, gender, and race. However, this type of discussion partner seems to be specialized in discussion and socializing activities rather than exchanging support. The class-specific probability of the support variables from this group—providing, receiving, and expecting support—were substantially low at 0.42, 0.10, and 0.33, respectively. These values indicate that the respondents were less likely to rely on this type of network members for mobilizing support. Another notable characteristic of this group, as illustrated in Table A.7, was that 39% of the newly known alters belong to this group. While there are a few newly met alters in the sample, this result indicates that people have some emotionally close person who they frequently socialize with and discuss their personal matters even if they meet less than once a year. This type of confidant made up 19.1% of the overall discussion partners.

*Remote-type confidant:* 19.7% of confidant ties were assigned into this third class, which was named the “remote-type confidant.” Most of the alters in this class lived far away from the respondent and were more than one hour away. Due to this geographical separation, the respondents were less likely to mention these alters as support and socializing partners. Yet, the respondents maintained strong emotional attachment with this type of alter and frequently relied on them for discussing important personal matters. More than two-thirds of the alters in this class were either extended family members such as siblings (33%) or friends (31%). As with the other two types of confidants, this group demonstrated a high level of homogeneity in race, gender, and age dimensions. However, alters in this type illustrate the highest gender homophily (74%) compared with other groups.

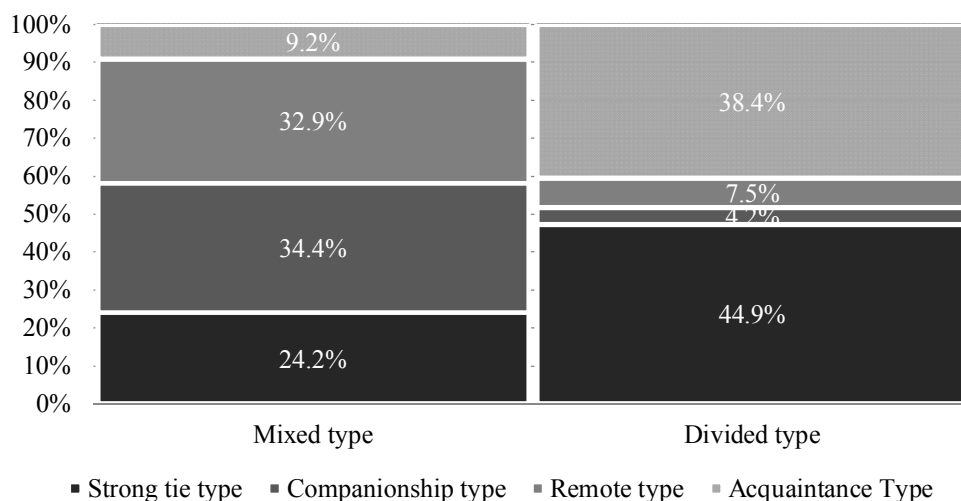
*Acquaintance-type confidant:* The last type of confidants, which made up 24% of the overall discussion partners, demonstrates the most deviant characteristics of the conventional assumption of the discussion partners. Alters in this class were neither emotionally close nor supportive. Although they lived within a reachable distance and played a discussion partner role, they rarely exchanged support or socialized with this type of alter. The dominant role relationships in this group were “others,” such as neighbors, co-workers, professionals, acquaintances, or members of social groups. As illustrated in Table A.7, 41% were assigned in this type. Some friends and extended family members (22 % of friends and 20% of extended family members) were assigned to this type of confidant. This type of discussion partners was labeled as the “acquaintance-type confidant,” and not surprisingly, 42% of newly met alters belonged to this type of confidant.

In sum, as expected from hypothesis 1, the results from tie-level latent class reveal four distinct types of discussion partners. As assumed in previous studies, some of the discussion partners were strong and supportive relationships (the strong tie-type). Yet, the participants also mobilized their discussion partners from weak social relationships that were neither supportive nor emotionally close (the acquaintance-type). A substantial proportion of the discussion partners in effect can be categorized as social relationships that are between strong and weak ties. The companionship type confidants were emotionally and geographically close social relationships,

but they do not actively engage in exchanges of support. The remote type confidants were also emotionally close alters but less active in exchanging and socializing activities, mainly due to the geographical barriers. This finding implies that strong and supportive social relationships are not the only type of discussion partners or the dominant characteristics of the discussion partners. Rather, a group of discussion partners in personal networks is a set of diverse social relationships in terms of their relationship nature and supportive functions.

### The different composition of discussion partners.

On an individual level (level 2), the final MLLAC model indicates that the individuals were grouped into two different clusters according to the varying distribution of the four types of discussion partners. As illustrated in Table A.8 and Figure 2.5, the confidant networks of the first cluster members were mainly configured with the strong tie-type (49.0%) and the acquaintance-type (24.8%) discussion partners, and 58% of the respondents belonged to this cluster. Compared with the first cluster, members of the second cluster have more companion-type and remote-type confidants (44.3% and 18.2% respectively), whereas strong tie-types and acquaintance-type confidants make up a relatively smaller proportion than those in the first class (33.7% and 3.7% respectively). Based on the different distribution of the four types of confidant across two individual-level clusters, the first group was named as *a divided-type* confidant network and the second cluster as *a mixed-type* confidant network.



**Figure 2.5.** Person-Level Confidant Network Configuration

The results from the covariate model presented in Table A.9 illustrate the additional differences between the two types of confidant networks. Although the overall network size was not significantly different between the two groups, the respondents in the divided-type confidant network have more discussion partners (5.15) than the mixed-type confidant network group (5.03). In addition, kin ties were proportionally larger in the divided-type confidant network group than in the mixed-type confidant network. More non-white ethnic groups belonged to the divided-type, the residential tenure in the current town of this group was longer, and the

members of the divided-type class were more likely than the mixed type to report that they are introverts.

### The different effects of discussion partners.

The above results illustrate that confiding networks are configured in two different ways according to the varying distribution of the four types of confidant relationships; the divided-type and the mixed-type. Then, what type of confidant network composition is better for mental health? If people receive benefits from a confiding behavior regardless of whom they confided in, then there will be no differences between the mixed and divided group because the number of confidant ties is not substantially different between the two groups. If people receive benefits mainly from a strong and supportive confidant relationship, then members of the divided-type will be less depressed than those of the mixed type confidant network because the members of the divided type have more strong-tie type confidants than the mixed type group.

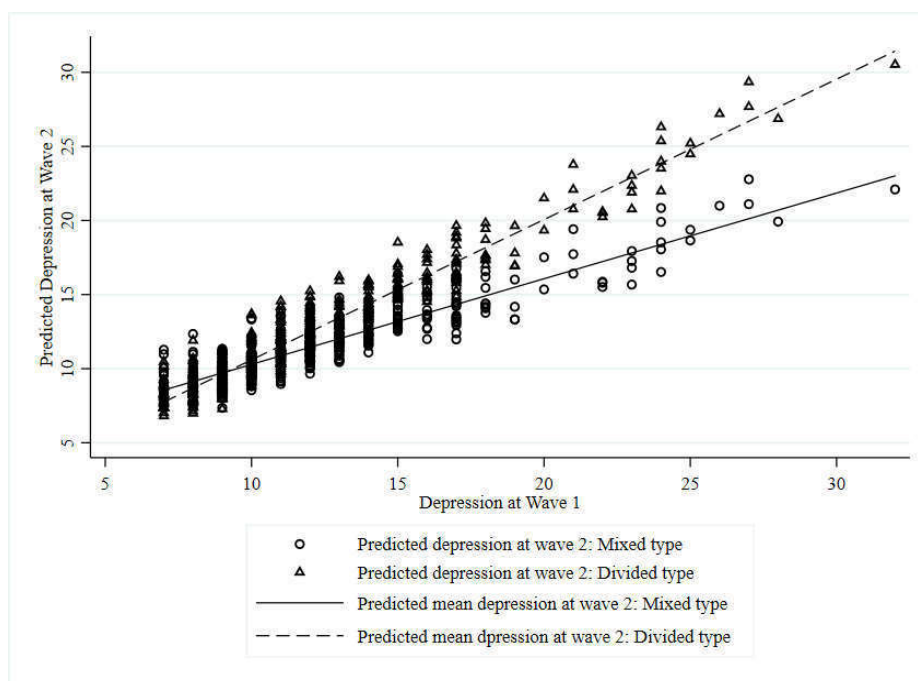
Table 2.1 illustrates the OLS regression models that predict the effects of the two types of confiding networks on depression levels in wave 2, controlling for other variables in wave 1, including depression in wave 1 (the full results are in Appendix). In model 1, the direct effects of the confidant network composition groups on the depression in wave 2 as controlling the baseline depression in wave 1 and the other covariates were examined. Then, an interaction term between the depression level in wave 1 and the cluster variable in model 2 was added, which compares the buffering effects between the two types of confidant network composition. In both models, the mixed-type cluster was set as a reference category for the comparison.

**Table 2.1.** Regression Estimates Predicting Depression at Wave 2

	Model 1		Model 2	
	Coef	S.E	Coef	S.E
Depression in Wave 1	0.722***	0.053	0.491***	0.068
Mixed type				
Divided type	0.847**	0.296	-3.389**	1.104
Depression in wave 1 X Mixed type				
Depression in wave 1 X divided type			0.369***	0.099
Number of discussion partners	0.192**	0.065	0.175**	0.064
Network size	-0.073*	0.030	-0.069*	0.029
Constant	4.267**	2.342	6.850**	2.2896

\* p-value<0.05, \*\* p-value<0.01, \*\*\* p-value<0.001

Model 1 illustrates a strong and significant association between the depression level in wave 2 and the types of confidant network configuration, and this result indicates that the members of the divided type confidant network have higher levels of depression in wave 2 than the mixed type confidant networks, net of controls. Although the participants in the divided-type confidant network have more strong and supportive confidants (i.e., the strong-tie type confidant) and a larger number of overall confidant ties, their depression levels in wave 2 were significantly higher than members of the mixed type confidant network who had more confidants in between strong and weak social relationships.



**Figure 2.6.** Predicted Depression in Wave 2 by Two Confidant Network Composition Cluster

The interaction term between depression in wave 1 and the two types of confidant network composition in model 2 illustrates that the effect of depression in wave 1 was significantly mitigated for the mixed type confidant network group compared with the divided type. Figure 2.6 illustrates the association between depression in wave 1 and predicted depression in wave 2 by two groups of confidant network composition based on estimations from Model 2 in Table 1. The hollow triangle and hollow circle dots represent the predicted depression levels in wave 2 of individuals in the divided and mixed type group, respectively. The dash and solid lines plot the both group's predicted mean of depression in wave 2, respectively. Among the individuals, particularly those with high depression levels in wave 1, the participants with the mixed type confidant network had substantially lower depression levels in wave 2 than others with the divided-type cluster. This result suggests that depression is more effectively attenuated by discussing important personal matters with diverse social relationships instead of relying on strong social relationships.

## Conclusion

This study attempts to determine the different types of discussion partners and test their varying effects on mental health. Although previous empirical studies have confirmed the importance of core discussion partners in various individual-level outcomes, most have relied on the assumption that core discussion partners represent a set of intimate and supportive social relationships. Accordingly, the amount of core discussion partners in personal networks has been frequently used as a proxy for the magnitude of social support, which helps people to maintain their mental health. However, current networks studies reveal the diversity and dynamic of confidant relationships and their varying influence on mental health according to whom people

confide in and what is discussed (Bearman and Parigi 2004; Small 2013, 2017; Perry and Pescosolido 2015).

If the core discussion partners are not a set of homogenous social relationships, the question is how many different types of relationships are discussion partners and how the differences in their varying nature can be captured. In this study, an alternative approach to identifying the characteristics of discussion partners by assessing the multiple aspects of social ties for describing a given social relationship has been developed. The main idea is that a social relationship is defined by the combinational patterns of the multiple characteristics of social ties. This approach suggests that the multiple forms of confidant ties can be detected by assessing how their intimacy, geographical proximity, and other social support exchanges are combined.

Applying this approach, using UCNets data, four different types of confidants were identified: the strong tie-type, the companion-type, the remote-type, and the acquaintance-type confidant. The strong tie-type confidant fit well with the previous assumption of the core discussion partners as this type of confidant provides multiple social services with strong emotional bonds and geographical closeness. However, the other three types of confidants cannot be included in the conventional expectation for several reasons. These three deviant types suggest that people sometimes discuss their personal matters with alters who are reachable and emotionally close but do not actively engage in exchange help (the companion type). People may also visit intimate alters who live far away (remote type), and sometimes, people talk about their personal matters and seek advice from alters who they are not emotionally close to or interact with intensively (acquaintance type).

The above empirical analyses also illustrate two different configurations of confidant networks according to the distribution of the four types of confidants. The mixed-type configuration of confidant networks has substantial numbers of the companion type, remote-type confidants, and strong tie-type confidants. Meanwhile, the divided-type confidant network has more strong-tie type and acquaintance-type confidants than does the mixed type group. Although the divided-type confidant network has more strong and supportive confidants and the overall number of confidant ties is slightly larger than the mixed-type group, people with the divided-type confidant networks were more likely than the mixed-type group to be depressed, and their depression was less attenuated by their core discussion networks.

This study has implications for both the social network and health academic fields. The findings of the multiple types of confidant ties support current studies on core discussion networks, which argue that core discussion partners are not necessarily strong, supportive, and stable social relationships (Bearman and Parigi 2004; Small 2013, 2017). Further, this study illustrates that strong and supportive confidant ties are not the dominant types of confidant relationships. Approximately two-thirds of confidant ties are drawn from less strong or less supportive social relationships.

More broadly, the findings of this study challenge the strong tie concept that is accepted in social network studies. In his seminal paper, Granovetter defined “the strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie.” (Granovetter 1973). Many of the empirical measurements of strong ties such as emotional closeness, the frequency of interaction, exchanging social services, or mutually confiding have been validated by the linearity assumption of these four elements of social ties. Simply, when people described a certain network member as confiding partners, for example, researchers often assumed that this relationship was also emotionally close and supportive. Yet, this study demonstrates that mutual

confiding is not necessarily linearly associated with either emotional intensity or social support exchanges. Some network members are emotionally close but do not actively engage in support exchanges due to geographical separation. In addition, there are emotionally and geographically close network members who are seldom named as support exchange partners. This finding suggests that the elements of social ties are non-linearly combined. Furthermore, by determining the non-linear combination pattern of tie-level characteristics, researchers can delineate multiple types of social relationships that do not fall into simple categories based on the strength of the ties.

Related to health and network studies, this study is in line with previous social support and network studies focusing on the multidimensionality of support networks. These studies insist that the implication of support networks for health outcomes cannot be understood comprehensively without including the multidimensional nature of social networks (Fiori, Smith, and Antonucci 2007; Litwin 1998 Gerstorf, Smith, and Baltes 2006; Bosworth and Schaie 1997). For example, large size networks would have different consequences on health outcomes depending on whether a large number of alters are kin or non-kin. Along with previous studies, this study suggests an alternative method for capturing heterotypic social networks by focusing on the multidimensional nature of dyadic social relationships instead of social networks.

Subjectively, the results of this study challenge the assumption of the implication of strong and supportive social ties on preserving mental health. The absence of strong social relationships may be a proxy for social isolation, which causes several depressive symptoms and makes it hard to cope with stressful conditions (Cohen and Wills 1985; Thoits 1985, 1995; Chu et al. 2010). Yet, this does not necessarily mean that having strong supportive ties is enough to maintain or achieve wellbeing. The findings of this study suggest that social relationships that are in between strong and weak ties in terms of intimacy, supportiveness, and reachability may be more important for attenuating depression given the existence of strong social relationships.

### **Limitations and further research**

This study determined the multiple types of confidant ties and demonstrated their varying implication on mental health. There are a number of important issues that this study did not directly address. First, the mutual confiding relationship is not a fixed and stable relationship. People may choose different alters from their social networks or even from their social networks according to their subject matter, personal situation, relationships, or institutional context where a particular relationship is embedded (Bearman and Parigi 2004; Small 2013, 2017; Perry and Pescosolido 2015). Although this study did not examine the changes in the multiple types of confidant ties because this study is based on cross-sectional data, longitudinal data would allow researchers to understand the varying trajectory of changing confidant ties according to the types of confidant ties and test the effects of tie-level and individual level factors on the dynamics of confidant ties.

Second, it would also be possible to conduct a comparative study of the heterogeneous type of confidant relationship between past and current periods. This comparison study could provide a fresh perspective to the current debate on the decreasing core discussion partners in American's personal networks. McPherson and his colleagues found that the number of core discussion partners in 2004 GSS data had significantly shrunk compared to 1985 GSS data (McPherson, Smith-Lovin, and Brashears 2006). In addition, many critics suggested and tested several possible biases of the core discussion network questionnaire in 2004 GSS data (Cornwell,

Laumann, and Schumm 2008; Fischer 2009; Paik and Sanchagrin 2013; Byungkyu and Bearman 2017). Despite these empirical issues, it is still important to question whether and how core discussion partners have changed over the last few decades. This study's findings on heterotypic confidants imply that the differences between past and current core discussion partners appear in multiple aspects. For example, one possible hypothesis will be that the development of communication technology and the diversification of communication media will lead to an increasing proportion of the remote type of confidants. While this comparison study is beyond the scope of the current study, future studies can determine the multiple aspects of change core discussion partners by accounting for the multiple forms of confidant ties.

Lastly, the causal links between confidant network composition and depression require further investigation. Although some participants who confided with the strong tie-type and acquaintance-type confidants had significantly higher levels of depression, this may be because depression makes people rely more on their strong ties or acquaintances such as professionals and physicians rather than middle-level strength relationships. The causal relationship between depression and selecting confidants is a promising area for future research.



## Chapter 3

# Multiple types of friends and life course

### Introduction

People dwell among friends as well as family over their life course. Particular life stages and transitions of life course shape the opportunities to meet and interact with friends. In response to the change in their life course, people chose their friends and change their ways of interacting with their friends. By making and adjusting friendships, people adopt new life conditions, maintain social integration, keep social identities, and mobilize needed resources and help.

How do friendships differ across the life course? Many social sciences such as sociology, gerontology, social psychology, and social network studies have been concerned with this question. A rich set of empirical studies have demonstrated that the number and proportion of friends in social networks are significantly different between young and old, married and single, and employed and unemployed. Yet, many empirical studies, particularly those using quantitative data, have often ignored the complex and ambiguous nature of friendship by defining the friends as if it is a single designated role category.

The term friend is in effect very ambiguous and covers multiple forms of relationships (Adams, Allan and Granovetter 1998; Fischer 1982; Pahl 2002; Pahl and Spencer 2006). The different types of friends will be differently affected by life context at each stage of the life cycle, even if they are all named as a friend. At a certain life stage, its structure of opportunities and constraints will strengthen some friendships while other people may lose friends in the same context. Without accounting for the heterogeneity of social relationships within the friend category, it is hard to comprehensively understand the implication of life course on friendships.

The aim of this study is to twofold; first, categorizing different types of friends, and second, examining the varying effects of marriage and employment status on friendship regarding the heterogeneity of friends. Survey data drawn from the University of California Social Network studies (UCnets) show that young and old populations on the west coast of the U.S.A. have four different types of friends and the distribution of these varies according to age, marriage status, and job market status.

### Life Course and Friendship

Over the life course, people constantly experience changes in friendships. During life transitions, people make new friends, and some friends may gradually or rapidly disappear. Relationships with remaining friends may also change. The alternation, ebbs, and flows of

friendships in personal networks simultaneously occur within the opportunities and constraints of each life stage (Gerson and Stueve 1977). Accordingly, the composition of an individual's friendships at a certain life stage is a constellation of heterogeneous social ties that has gone through different friendship processes (Adams and Ueno 2006). However, studies of the differences in friendships across the life stages have often focused on the quantities of friends in personal networks rather than their diversity. In the following section, I will discuss this point in relation to two particular life stages: marriage and employment.

### **Marriage**

Life contexts related to engaging in and ending marriages and romantic relationships shape opportunities to form and change friendships. Through marriage or partnership, individuals often have chances to meet new people from their partner's side. By interacting with their partners or spouses and their friends, they are likely to make new friends of their own (Fischer and Oliner 1983). By doing so, they develop co-friendships. The proportion of acceptance of each other's friends and shared friends between partners tend to increase along with the length of the partnership (Felmlee 2001). Divorce or widowhood also offer opportunities to build new friendships. Studies that have examined the effects of losing a spouse on personal networks have demonstrated that while the overall kin networks of older people shrink after the divorce or widowhood, people tend to compensate for the loss and revive their social relationships by intensifying or expanding non-kin relationships after losing their partner (Rook and Zettel 2004; Cornwell 2008). For example, Cornwell's study using nationally representative survey data shows that widowed people have more active interaction with their close friends than married people (Cornwell 2008).

The very same life contexts related to marital status or engagement in romantic relationships influence the alteration of existing friendships. Married people may introduce some of their friends to their partners, which may deepen the existing relationship under the triadic relationship with their partners, and interactions would be different from in the past (Milado 1982; Park et al. 1983). In the case of losing a spouse or a romantic partner, people tend to go through emotional, economic or social strains by intensifying their relationships with old friends (Gerstel 1988)

On the other hand, people also lose some of their friends along with life transitions. The 'dyadic withdrawal' hypothesis in marriage studies demonstrates that coupled or married people are likely to invest less time on interaction with some of their old friends compared with when they were single (Fischer et al. 1989). The dissolution of some friendships may be due to either that the person spends more time with a partner and others together with their partner or that a partner or new friends fulfill individuals' daily needs that used to be met through their old friends. The loss of friends also happens after the breaking up of marriage and romantic relationships. Not surprisingly, the pressure of loyalty makes their friends take a side, and in this way people usually lose some of the mutual friends with their former partners after divorce or a broken romantic relationship. Alternatively, the divorcee may feel too awkward to participate in social activities that they used to do together with their former partner. Kalmijn and van Groenou showed, for example, that divorced people are less likely to stay in contact with shared relationships with their former partners such as neighbors (Kalmijn and van Groenou 2005).

### **Employment status**

The workplace is the main foci of activities of people in the labor market, in which people meet and regularly interact with others. Some work-related relationships may be able to develop into friendships. People in the labor market may also be able to find new social relationships in leisure time activity after work. While they did not explicitly test the impact of labor market status, Stueve and Gerson showed that the proportion of workplace friends in Detroit men's social networks increases among young and middle-aged fathers (Gerson and Stueve 1977). Pahl Spencer's study also shows that friends newly met after entering the labor market are likely to be associates or casual friends whom people consider useful or have enjoyed social time with before the level of complexity and intimacy has deeply developed (Pahl and Spencer 2006). Retirement also relates to the change of opportunity structure as strongly as entering the labor market does. Elderly retired people are likely to spend their time more in volunteering and social club activities and socializing with their neighbors than others still in the labor force (Cornwell 2009; Henkens, Kalmijnn and van den Bogaard 2014). Informal social organizations and the neighborhood offer a new pool of interaction partners whom retirees spend more time with in their daily life and eventually develop friendships with.

As in a marriage, employed people may not find time for interaction with their old friends as much as before they entered the labor market due to their commitment to the work. As a result, their old friendships may be either discontinued or their form of interaction altered. Retirement also alters relationships sustained during working careers. Some work-related relationships are likely to be discontinued after retirement (Mutran and Reitzes, 1981; van Tilburg, 1992, 2003), while the remaining workplace friendships are usually transformed in the content of their interactions. For example, some of the workmates become regular participants of the leisure time activities of retirees. Retirees may also keep their friendships with some of their former co-workers via exchanging instrumental help (Henkens, Kalmijnn, and van den Bogaard 2014).

The overall friendship network in each life course stage, therefore, can be understood as a consequence of multiple dynamics (Neyer et al. 2013). The differences of friendships across the life cycle, then, are multifaceted. Some types of friends will be consistently maintained in friendship networks regardless of marital status or employment, while other types of friendship will occupy substantially more or less proportion of the overall friendship network according to the marriage and employment status. As Ueno and Adams pointed out, however, the multiple processes of friendship have rarely incorporated an examination of the differences in friendship networks across life stages, although accumulated results of previous studies have demonstrated the size of friendship networks are significantly varied according to life events and life cycle (Allan and Ueno 2006). What types of friends, then, do people have, and how different are they?

### **Multiple Types of Friendship**

Empirical studies on friendship often assume that friendship is an idealized uniform entity (Wright 1969). A friend is a person who has a deep emotional bond with an individual, can be easily accessed, and provides emotional and practical support that meets the needs of individuals. Supposedly, they frequently interact and are intensely committed to each other for a long time. The friend relationship is also expected to be based on trust, honesty, loyalty and many other good qualities. Needless to say, people wish to have this type of friendship, and some might have a friend who satisfies all these qualities. However, in practice, not all friends satisfy the golden standard of friendship nor are all friends identical to each other. Even within one individual's

friendship network, each relationship is usually different from each other in many ways. For example, it is hard to expect that my feelings toward and ways of interaction with a middle school friend would be the same with one whom I met in the workplace. In fact, the term friend is ambiguous and contains many different social relationships. (Fischer et al. 1977; Fischer 1982, Adams et al. 1998; Spenser and Pahl 2006). The rich research tradition of friendship studies has dealt with the heterogeneity of friend relationships. Usually, the differentiation of friendship has been made based on a single dimension of the relationship. The most widely applied characteristic for classifying a different type of friend is the level of intimacy. By directly asking respondents to distinguish their friends based on the level of closeness, researchers have distinguished friends from close friends to very close and best friends (Craven and Wellman 1973; Shulman 1975; Bell 1981a; Wellman 1982, 1985, 1988; O'Connor 1987; Armsden and Greenberg 1987; Wellman and Wortley 1989, 1991; Narr et al. 2017). Besides intimacy, some studies take aspects of exchange as a criterion for classifying friendships. For example, Reisman differentiated friends based on the reciprocity from associative, reciprocal, and receptive friendships (Reisman 1981). As well as intimacy and reciprocity, many other aspects of friendships can also serve for differentiating friendships such as demographic characteristics of friends (e.g., male and female friends), homophily (e.g., friend of the same race or ethnicity), origin of the relationship (hometown friend or workplace friend), and so on.

Differentiation of friendships using a single dimension may be able to effectively capture different forms of friendship and their varying functions and effects. Theoretically, it may be meaningful to find the most important dimension of friendship that is supposed to reflect individuals' valued self-attributes (Wright 1978). However, a singular dimension classifying friendship often fails to regard multiple other characteristics of friendship and their interdependent nature. For example, as O'Connor noted, while closeness can serve to differentiate the degree of friendship, the varying definition of closeness itself cannot be generalized enough to treat every close friend as a similar relationship. (O'Connor 1992). The meaning of closeness should be different according to the other characteristics. The closeness of same sex friends, for example, would be different from the feeling of closeness of different sex friends. In the same sense, exchanging practical support with intimate friends cannot be identical to that with non-close friends in terms of the pressure of reciprocity or equity.

Instead of singling out one important dimension of the friend relationship, other studies, particularly social network studies, have developed concepts to qualify social relationships through multiple characteristics of social ties such as the strength of ties and multiplexity of a dyadic social relationship. The main idea of the strength of ties suggested by Granovetter is that several aspects such as the amount of interaction, emotional affection, mutual confiding, and exchanging of services are likely to be linearly associated with each other (Granovetter, 1973: 1361). Emotionally close friends are likely to interact frequently, exchange multiple forms of support and services, disclose their private issues and so on. By assessing the linear association of multiple characteristics of social ties, researchers may be able to quantify the friendship on the line of tie strength from weak friendships to strong friendships. The multiplex concept can also be applied for delineating different types of friends by considering multiple characteristics of a relationship. People may describe some of their friends as more than just friends; they may also be a coworker, neighbor, or even kin. Friends with multiple roles are different from single role friends (Fischer 1982).

The strength of ties and multiplexity offer another efficient way of delineating friendship: by considering the multifaceted characteristics of a friend relationship instead of a single aspect.

Still, these approaches are also not enough to capture the various types of friendship due to their limitations in conceptualization and operationalization. The concept of strength of ties assumed that multiple aspects of social ties are probably linearly combined (Granovetter 1973). However, this linear association among diverse characteristics of a social relationship is not always true. For example, I interact with my roommate more frequently than with my hometown friends, even though I feel far more intimacy with my hometown friends than with my housemate. The multiple aspects of a dyadic relationship may associate with each other nonlinearly rather than linearly in many cases. The multiplex concept is also not encapsulated by the linearity assumption. The multiplexity concept is usually operationalized by counting the number of overlapped characteristics. When a certain tie was described as a co-worker as well as friend, the multiplex score of this tie would be two (i.e., two roles were overlapped). In terms of the operationalization of multiplexity, this tie would be treated as the same dyadic relationship as another tie that was described as a neighbor as well as friend (also two overlapping roles). The multiplexity measurement fails to differentiate these two ties. Even though the same number of characteristics overlaps in some sets of ties, those dyadic ties can be different according to the combination of characteristics overlapping in those ties ( $A+B$  is not the same as  $B+C$ ).

Instead of singling out the most important dimension of friendship or quantifying it on a single linear line (i.e., strength or degree of multiplexity), in this study, I argue that the distinctiveness of a particular friendship is derived from its own configuration pattern (probably nonlinear) of multiple characteristics and relational contexts. Let us picture three friends: A, B, and C. When the main components of a friend relationship are intimacy, volume of contact, support exchange, and mutual confiding, people may describe friend A as a friend whom they are emotionally close to and confide their personal matters in, but do not frequently meet or exchange physical support with each other due to some constraints (i.e., geographical separation). On the other hand, the relationship with friend B may be described as that they frequently interact with each other but are not close enough to disclose their important personal issues. Friend C may fulfill all of these conditions (i.e., emotionally close, frequent contact, actively exchanging support and confiding personal matters). When researchers choose emotional closeness as a criterion for classifying friendships, then friend A and friend C are treated as identical friends who are different from friend B. If the study selects contact frequency as the important dimension, then friend B and friend C would be counted as an equal relationship (frequently interacting friends). However, from the standpoint of a person who has these three friends, they may not be identical relationships in any sense. In practice, what differentiates these three friends would be how the components of friend relationships are combined. The relationship with friend A could be configured as {Close, Not-frequent interaction, Confiding}, whereas friend B would be {Not close, Frequent interaction, Not-confiding} and friend C would be {Close, Frequent interaction, Confiding}.

A few, but exceptional, studies have focused on the configuration pattern of multiple elements of friendship for capturing the heterogeneity of the friendship. In their research on friendship, Spencer and Pahl inducted eight types of friends from simple friendship to complex friendship (i.e., Associate, Useful contact, Favor friend, Fun friend, Helpmate, Comforter, Confidant, Soulmate). The simple friendship contains a single main interaction component such as a common activity (Associate), exchanging information or advice (Useful contact), socializing (Fun friend) and exchanging support (Favor friend). On the other hand, the complex types of friendship are configured with different activities and characteristics. A Helpmate in their typology, for example, refers to a friend who provides practical help and socialization, but not

confiding or emotional supporter. A Comforter, however, provides emotional support as well as practical help and is a socializing partner. The confidants are likely to be people in whom individuals disclose their personal matters as well as enjoy their companionship. The Soulmate contains most of these qualities and attributes. Although they described diverse types of friendships mainly based on the social behaviors drawn from interview data, the typology of Spencer and Pahl's study shows that the complex and multifaceted nature of friendship can be inductively reduced into countable subtypes of friendship.

In sum, the term friend covers different forms of social relationships. In each single friend relationship, multiple characteristics intertwine complexly with each other. Social relationships under the label of friend will be similar with or different from one another according to how those multiple characteristics associate with each other. This study seeks to find different subtypes of friendship ties by inductively figuring out the configuration patterns among seven relational characteristics that I discuss in the variables section of this paper; homophily, emotional attachment, geographical proximity, length of relationship, origin of relationship, interaction volume, and social exchanging behaviors. In regard to life course and friendship dynamics, this study expects to find varying distribution of multiple types of friends according to marital and employment status.

## **Data**

This study uses wave 1 and wave 2 data from the University of California Berkeley Social Networks Study (UCNets). The wave 1 survey was conducted in 2015 in a large metropolitan area on the west coast of the U.S.A. A follow-up survey (wave 2) was conducted in 2016. The study population of UCNets data constituted two age groups (21 to 30 years old and 50 to 70 years old). The respondents were sampled through a three-stage process. First, 30 census tracts were selected in proportion to the population, and households were randomly sampled using the full list of mailing addresses in each census tract. Second, solicitation letters invited any member of the sampled household of qualifying age to participate in the survey. Third, recruited participants, were interviewed by either face-to-face interview (75%) or web survey (25%). Ultimately, 674 old participants (aged 50 to 70 years old) and 485 young participants completed the survey.

UCnets collected a rich set of information about both respondents and their relationship with social network members. At the respondent level, the survey covered socio-demographic characteristics, life events, and physical and mental health status to subjectively evaluate their social networks. Through ten name-eliciting questions, respondents listed the members of their social networks. The name-eliciting questions constituted several social exchanging questions such as socializing together, receiving practical and emergency help, confiding, asking advice, and providing help to. In addition to the social exchanging questions, the survey asked for the name of their spouse (or romantic partner), housemate, and someone whom they felt difficulty with. On average, respondents provided about ten names. Based upon the list of network members, the survey asked a set of name-interpreting questions that provided several tie level characteristics such as the relationship of each tie (spouse, parent, friend, etc.), emotional closeness, and geographical proximity.

Among those listed through name-generating questions, as a subsample, the survey selected alternatives of up to five names that were named on the top or near the top of the list for each particular name-eliciting question. For these subsample alternatives, the survey asked for further

detail such as the origin of the relationship, tenure of relationship, contact frequency, and communication frequency via phone call, texting, or other online medium. To fully utilize these details, I used the subsample alternates named at wave 1 and wave 2 in this study. The final case of this study is young and old age respondents who have at least one friend in their subsample network members and have completed questions in wave 1 and wave 2. The final numbers of respondents included in this study are 383 young respondents and 525 old respondents. The total number of friends in this study is 931 for the young group and 1406 for the old age group.

## Measurements

This study attempts to delineate different types of friends by assessing the configuration pattern of several dimensions of relationships. For this purpose, I exclusively analyzed friendship ties in personal networks with 13 variables that capture multiple characteristics of friends and relationships with those friends. The operational definition of friends and details of the variables are described below.

**Friends:** Friends in this study refers to alters in both waves whom respondents described as their friends. Because the survey allowed respondents to choose multiple roles for describing particular alters, some of the kin ties are also identified as friends. While the concept of kin-friends itself has important meaning for understanding the friendship, I excluded them from the analysis in order to narrow down the operational definition of friends as people whom respondents meet outside of their family. Other non-kin ties with multiple roles were included as long as the respondent defined them as their friends. As explained above, Ucnets selected a subsample of alters for asking further details. This means that some of the friend ties in the Ucnets study are not included in the subsample, and thereby not in this current study. The subsample alters are assumed to be more likely than other alters to be active in recent interaction and probably closer to respondents. Conceptually, then, the friend ties in the subsample can be defined as actively mobilized friendships at the time of the survey. If the different types of friends emerged among those active friends, it could be said that friendship has different forms even among active friends. As shown in Table 1, the young and old age group respondents have on average 10.03 and 8.47 friends. This constitutes 59% and 56% of their total number of alters, respectively. The average number and proportion of friends in the subsample is 2.73 (60%) for the young age group and 2.97 (58%) for old age respondents.

**Homophily:** The similarity in a personal attribute such as gender, age, or race/ethnicity. People tend to be easily attracted to those to whom they have a similar background. More importantly, social stratification structures based on sociodemographic attributes such as gender or race/ethnicity increase the chance to interact with similar persons in their daily life (Cook, McPherson, and Smith-Lovin 2001). The similarity in terms of age, gender, and race/ethnicity with a particular friend depends not only on the personal inclination to the similarity but also on the social context where ego and alter firstly met together and maintained interactions. To the extent that the homophily reflects the social contexts of friendships, the similarity would serve to differentiate a particular friend from other friends. In this study, I used three homophily variables: whether a particular friend is the same gender, same race/ethnicity, or similar age.

**History of relationship:** Every friendship has its origin. People meet their friends in organizations, neighborhoods, schools, college, at work or through other persons (Fischer 1982, Grossetti 2005). Each of the social institutions and organizations where the friendship originates shapes the relationship and normative expectations of forms of interaction (Feld 1981). For

example, what people expect from work-related friends differs to some degree from friends whom they met at school or in the neighborhood. The length of relationships also makes creates variances in friendships. The longtime but not close friendship implies the sharing of many experiences and the maintaining of the friendship through the fluctuation of life conditions (Fischer et al. 1977). The quality of longtime friends clearly differs from that of new friends. Furthermore, the length of relationships may weaken the impact of the social organization or institution where the first meeting happened. For example, people maintain friendships with their coworkers for a long time. Longtime workplace friends may be close to other longtime friends, for example, if they met at college before the newly met workplace friends. The history of relationships (i.e., the origin and the duration of relationship) is the most important element for understanding the heterogeneity of friendships. The origins of relationships in this study were measured with six basic categories of where they first met: ‘childhood friends’ (grew up in the same neighborhood or met at school), ‘met at college,’ ‘met at work,’ ‘met in neighborhood,’ ‘met through others,’ and ‘met in other ways.’ I re-categorized this variable according to the age group. For the majority of old age respondents, friends who meet at college or university are more likely to be longtime friends, as with friends they met before college. I therefore merged ‘childhood friends’ and ‘met at college’ into one category for the age group. For the young age group, many of the young respondents were still enrolled in college and met many friends at their college. In contrast, the number of friends met at the workplace among the young age group was too small to be treated as an independent category. In response, I merged college friends and workplace friends into one category for the young age group. The duration of the relationship in this study is measured by the years of having known each other.

**Emotional closeness:** As discussed above, intimacy is one of the core components of friendship (Granovetter 1973). Emotional closeness, however, is neither a necessary condition for being a friend nor an independent element of friendship that is free from other aspects of friendship. Emotional closeness is not necessarily equal in every friendship, and a similar degree of closeness does not always guarantee similar forms of interaction. For example, disclosing personal issues seems to require a well-founded emotional closeness between the discussion partners. However, ‘Small’s recent study shows that a substantial number of confidants in personal networks were actually not close relationships (Small 2013). Fischer and his colleagues’ 1977 study also shows that the association between intimacy and contact frequency is mediated by geographical distance. Intimacy predicts interaction frequency only when the friends live near each other (Fischer et al. 1977). Thus, the emotional closeness of a friendship is one of the interdependent elements that is part of encompassing other aspects of friendship. In this study, I used the information from respondents’ evaluations about whether they felt especially close to a given friend or not.

**Geographical proximity:** Physical reachability is an important characteristic of a relationship to the extent that geographical separation impedes face to face interactions and exchanging instrumental forms of support. However, geographical distance does not necessarily disrupt all kinds of friendship. As recent studies on confidant relationships have found, partners for confiding in do not necessarily live close by or belong to a similar circle (Spencer and Pahl 2006; Small 2018). Furthermore, the diversification and development of communication media allow people to maintain their social relationship over geographical barriers (Fischer 2011; Hampton, Ja Her and Sessions 2011), meaning that friendship can be maintained between people over long distances. Again, however, it is also true that physical distance restricts face-to-face interaction and the exchanging of practical support. Thus, the people who live far away from



their friends would be understood differently and function in different ways compared with friends who live close by. In this study, the proximity was measured by whether a friend lived within the distance of a one-hour drive or beyond this distance.

**Contact frequency:** In order to sustain a relationship, people need to either meet or communicate with each other. The frequency of contact apparently correlates with closeness and proximity. However, it is also possible that people frequently interact with friends who are neither emotionally close nor easily reached. For example, workplace friends may spend much time together through their regular working time even though they are not emotionally close or live far from each other (Fischer et al. 1977). Similarly, friends of the same social organization or circle would be able to frequently meet each other through group events, but not all members in those groups would necessarily be close to each other. Frequently interacting friends are also likely to actively communicate via non-face-to-face methods (Fischer 2009, 2011; Hampton et al. 2011). Still, people may not attempt to call or text non-close friends even though they regularly or frequently meet with each other. Further, non-facial communication may serve to sustain relationships between friends who do not frequently meet due to living far apart. The frequency of contact and communication, therefore, do not necessarily linearly associate with other dimensions of dyadic relationships such as closeness or proximity. The survey measured the frequency of face-to-face interaction and communication via non-facial methods with six categories from ‘At least once a day’ to ‘Never.’ In an empirical test, I dichotomized these values into two categories based on the average: ‘Less than once a month’ and ‘At least once a month.’

**Social exchanging behaviors:** The content of interactions is another important element of friendship, and varies from friend to friend. Social support theories suggest different types of help including ‘informational,’ ‘emotional,’ and ‘instrumental’ support (House et al. 1988; Cohen and Syme 1985). Further, people mobilize different forms of support in different relationships (Wellman and Wortley 1990). As Spencer and Pahl’s study showed, some friendships contain a single exchanging activity such as socializing or confiding, whereas other friends interact with each other through multiple activities (Spencer and Pahl 2006). The contents of interactions, again, depend on other dimensions of relationships. Socializing would be conditioned by geographical accessibility, while confiding behavior does not necessarily require proximity. For practical chores, people may call a friend who lives nearby, but emotional closeness may not be a necessary condition for this type of support exchange. In this study, I used four social exchanging activities: socializing, giving and receiving help, emergency help, and exchanging advice/confiding. Each variable indicates whether each friend was named for each activity.

### **Covariates and control variables**

This study tested two main life course factors: marriage and employment status. I used three categories of marital status: ‘Single,’ ‘Partnered’ and ‘Married’ for both age groups. Single status refers to having neither a spouse nor romantic partners. The Partnered category indicates respondents who were in a romantic relationship at the time of the survey. The Single category of the young age group is mainly composed of never married people, while many of the old age singles had experienced divorce, widowhood, or separation. As for employment status, I categorized employment variables by the young and old age groups, because the work experiences between the two groups are obviously different. The employment status of the young age respondents was categorized into ‘Unemployed,’ ‘Students’ and ‘Full-time employed.’ For

the old age group, I classified employment status into ‘Unemployed,’ ‘Retired’, and ‘Full-time employed.’ In the model for testing the impact of life course stage on the type of friends, I used a controlled set of respondent level variables: age, gender, race and ethnicity, education and income level, tenure of residence, personality, network size, and proportion of kin in networks. Descriptive statistics of the variables are presented in Table B.1.

## Methods

This research utilized empirical models with two consecutive steps. In the first step, I implemented a multilevel latent class model for determining different types of friends. Latent class analysis is the widely applied clustering method, which classifies units of analysis into countable subgroups using the association patterns among observed variables (Lazarsfeld 1950; Goodman 1974; McCutcheon 1987). In personal network studies, researchers have used the latent class models for clustering personal network types that classify egos based on their social network characteristics such as size, a proportion of certain types of network members, and average closeness (Antonucci, Fiori and Smith 2007; Litwin, 2001; Youm, Laumann, Lee, and Youm 2018). Unlike the previous application of the latent class models, this study aims to group individual friendship ties rather than the respondents (i.e., egos). The challenge of classifying social ties is the multi-level structure of ego-centric network data. Individual social ties belong to the egos. This typical multi-level structure of personal network data requires taking into account the dependence of ties within an ego. The multi-level latent class model deals with the dependency issue among lower-level units within the upper-level groups by introducing the random coefficient into the latent class modeling. The random coefficient in the latent class model assumes that certain clustering parameters randomly differ across the upper-level units (Vermunt 2003, Lukočienė, Varriale, and Vermunt 2010). In the context of this practical study, the multi-level latent class model allows capturing the variance of particular model parameters for clustering friendship ties across egos by using the continuous random effect coefficient. In using the multi-level latent class analysis, the first step of the empirical test examines how many types of friends the young and late-middle age groups have, and interprets how different they are from each other within and between age groups using the configuration of six dimensions of friendship.

In the following analysis, I tested the effects of the ’ego’s marital and employment status on the probability of having certain types of friends. The LCA model allows not only the identification of sub-clusters of units using observed variables but also the testing of the effects of external variables on the probability of class membership by using the bias-adjusted three-step approach (Clogg 1981; Hagenaars 1993). The general procedure is that the subclusters are identified using latent class analysis (at 1-step) and from the 1-step, the classification score is assigned to each study case, which reflects each ’tie’s membership probability in a certain latent class (2-step). Using this posterior membership probability, it can be possible to test the effects of external variables on the probability being assigned to a certain latent class (3-step). Since marital and employment status in this study is from the ego (upper-level) and the latent class membership score is for the tie-level (lower level), the dependency of ties within an ego again needs to be considered when examining the effects of marital and employment status. I dealt with this issue by adding a group-level random coefficient in the model with these two covariates.

In implementations of multi-level latent class analysis, I modified models by allowing local dependence between certain pairs of variables that severely affect the model fitness (Vermunt

1997). BIC and AIC were employed for evaluating the goodness of fit of models (Anderson and Burnham 2004;). All analyses were separately conducted on two age groups (Young age group aged 20–30 years old and Old age group aged 50–70 years old). The set of statistical models in this study was implemented using the Latent Gold software. As shown in Table B.2, BIC and AIC scores suggest a four-cluster solution.

## Results

Do friendship networks differ across marital and employment status? Table 3.1 presents the average numbers and proportions of friends in young and old individuals' total and subsample network rosters across marital and employment status. The results from the simple ANOVA and Bonferroni multiple-comparison test show that the average number and proportion of friends are not significantly different according to the marital and employment status in both age groups. Only young married people show a significantly smaller size and proportion of friends in their total roster of alters than other young people. Married young people have on average 7.93 friends and they comprise 50% of their total network alters, whereas their counterparts who are either in a romantic relationship or single have more than ten friends that comprise 60% of their overall network members. However, these differences in the number of friends between married and non-married young people lost their statistical and practical significance when compared to the size and proportion of friends in the subsample. Do these results mean that people, at least those living on the west coast of America, have similar friendship networks regardless of their marital and employment status? No. In the following analysis, I show that people have different types of friends according to their marital and employment situations even if their number of friends is not different.

**Table 3.1.** Number of Friends by Study sample, Age group, Marital and Employment status

		Young age group		Old age group	
		Total Sample	Subsample	Total Sample	Subsample
Friends		Mean(sd)	Mean(sd)	Mean(sd)	Mean(sd)
Total <sup>a</sup>	N	10.03(5.15)	2.73(1.51)	8.47(5.08)***	2.97(1.83)**
	%	0.59 (0.21)	0.60 (0.25)	0.56(0.24)***	0.58(0.30)**
Marital status <sup>b</sup>					
Married	N	7.93(4.75)**	2.65(1.55)	8.74(5.28)	2.93(1.85)
	%	0.49(0.20)**	0.54(0.22)	0.55(0.24)	0.57(0.31)
Romantic Partnership	N	10.17(5.02)	2.69(1.51)	7.81(4.54)	3.02(1.86)
	%	0.60(0.20)	0.60(0.26)	0.55(0.25)	0.56(0.28)
Singles	N	10.63(5.49)	2.87(1.50)	8.25(4.86)	3.07(1.67)
	%	0.61(0.22)	0.64(0.25)	0.61(0.21)	0.63(0.27)
Employment status <sup>b</sup>					
Unemployed	N	9.18(5.22)	2.62(1.60)	8.80(5.31)	2.99(1.77)
	%	0.55(0.22)	0.60(0.25)	0.57(0.24)	0.59(0.29)
Student (Retired for old age)	N	9.98(5.13)	2.84(1.37)	8.08(4.93)	2.91(1.85)
	%	0.60(0.20)	0.66(0.23)	0.55(0.24)	0.56(0.29)
Employed	N	10.41(5.12)	2.69 (1.56)	8.68(5.04)	3.02(1.86)
	%	0.60(0.20)	0.57	0.56(0.25)	0.59(0.31)

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

- a: In this row, the one-way ANOVA models test differences between two age groups
- b: In the marital and employment status categories, the ANOVA models tested differences

### Diversity of Friendships

The final latent class models detect four distinctive types of friends based on the varying association patterns of friendship elements. I named them as Active friends, Long-distance friends, Longtime not close friends, and New friends. Table B.3 and Figures 3.1 and 3.2 show the class-specific conditional probability of each observed variable. I identified each friendship group using these values. Even though the young and the late-middle age group have the same number of subtypes of friends and I gave identical names for each group in both age groups, each type of friends shows substantive differences between the two age groups. I discuss the differences between the two age groups in detail below.

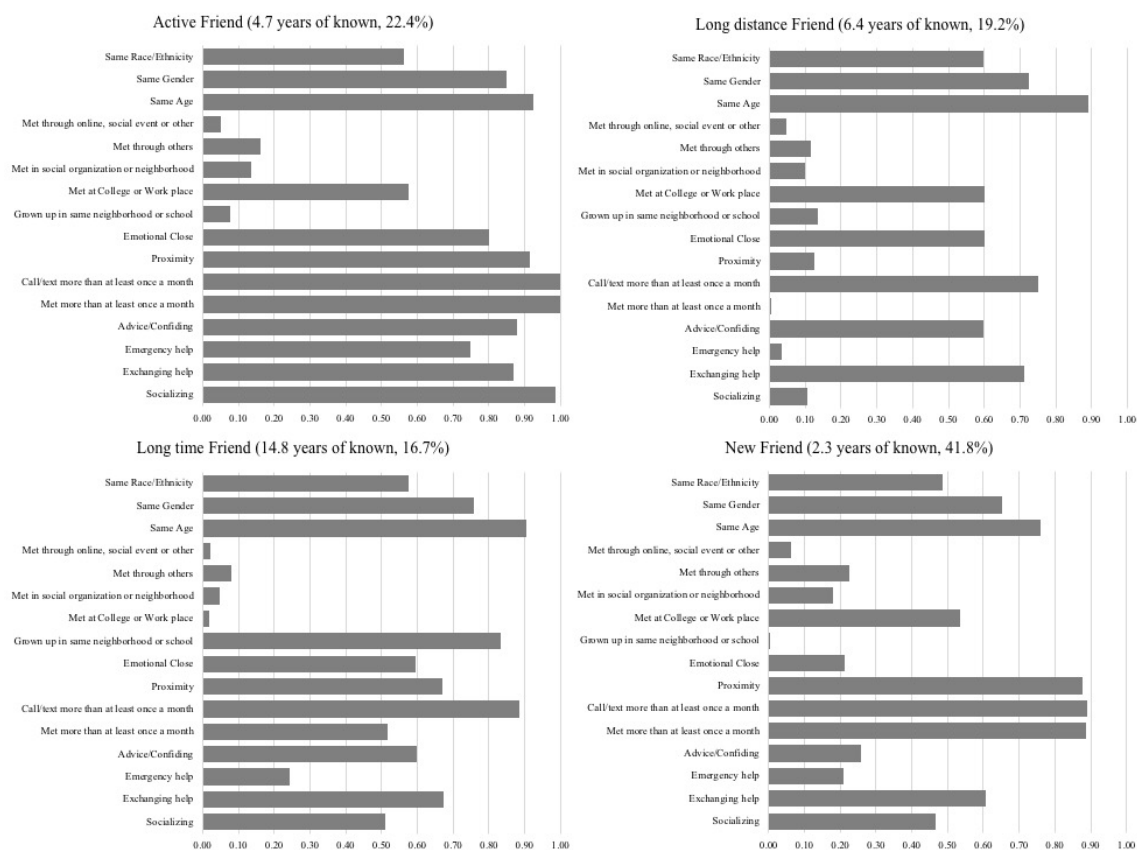


Figure 3.1. Conditional Probabilities of Four Latent Classes: Young Age Group

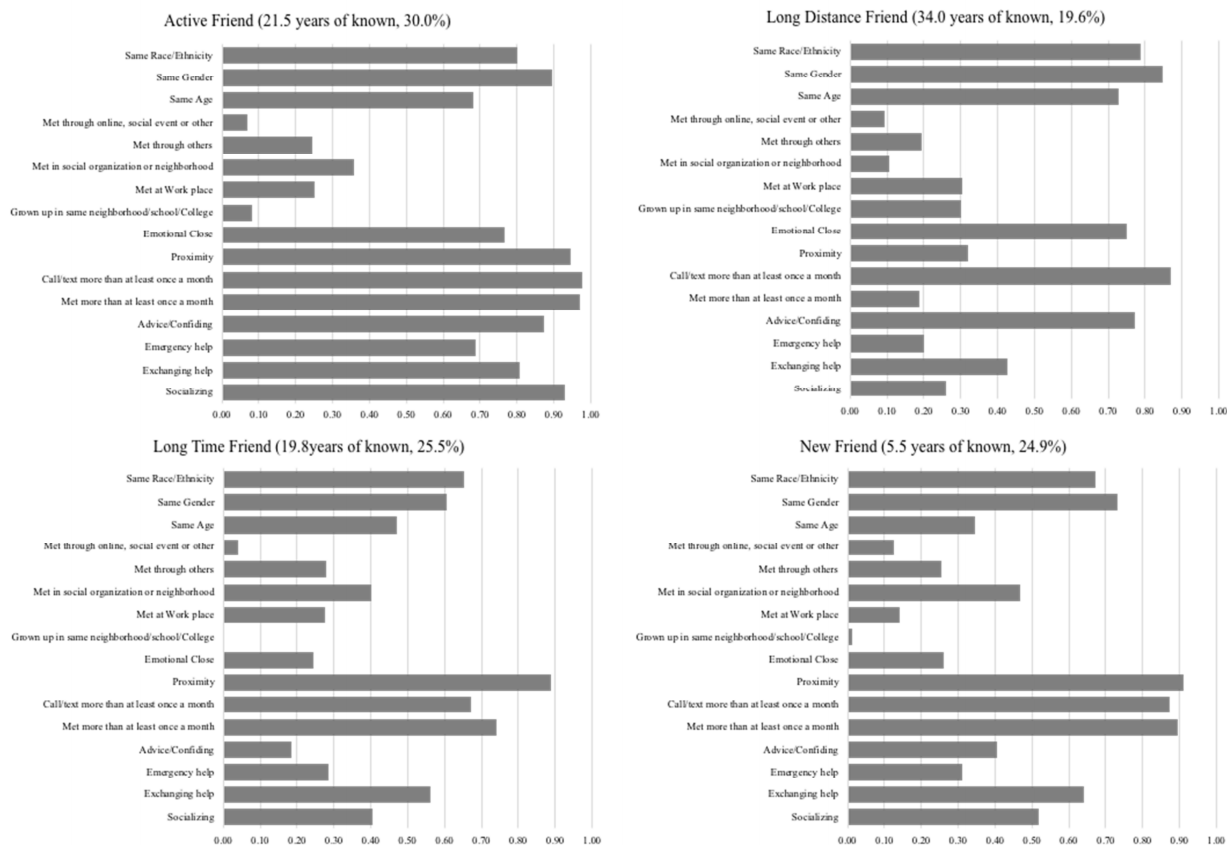


Figure 3.2. Conditional Probabilities of Four Latent Classes: Old Age Group

### The Active friend

More than one-quarter of friend ties were assigned to the group that I labeled as the Active friend (23.1% for the young and 28.1% for the late-middle age group). This type of friend seems to be close to the ideal type of friend that many studies often assume. In both age groups, this type of friend is highly likely to live within an hour’s driving distance and intensively interact with respondents in many ways; they frequently meet and communicate, often socialize together, exchange practical help, and discuss personal matters with and seek advice from each other. Indeed, people tend to rely on this type of friend more than any other in an emergency situation.

Even though the Active friend in both the young and late-middle age groups show similar characteristics in terms of maintaining a strong emotional bond and intense interactions, Active friends of the late-middle age group are different from those of the young people, particularly in the relational tenure and origin of the relationship. Apparently, the average time of knowing Active friends is almost four times longer among the late-middle age group than in the young (5.5 years for young and 22 years for the late-middle age). More importantly, the two age groups show a clear difference in the origin of relationships with Active friends. As reported in Table B.3, young people met more than 57% of Active friends in formal social institutions such as college or the workplace. Meanwhile, the majority of Active friends of late-middle age people originated from informal social organizations or the neighborhood, or through other personal relationships (34% from informal organization or neighborhood and 24% from other personal

relationships). The difference in the origin of Active friendships between the two age groups implies that through ageing, informal social organizations and neighborhoods and personal relationships may become more salient for the forming and developing of Active friendships.

### **The Long-distance friend.**

About 20% of friends in both age groups were composed of friends who lived far more than a one-hour driving distance from where people lived. I labeled this group as the Long distance friend. Like Active friends, people were likely to describe this type of friend as a person to whom they felt especially close and communicated frequently with via calling or texting. However, mainly due to geographical distance, they were not shown to frequently meet and socialize together. Instead, people often confided their personal matters to and sought out advice for important decision making from this type of friend. More than 60% of ties in this group originated from adulthood periods or workplace and college in both age groups. Accordingly, the relationship tenure with this type of friend is quite long (7.4 years for the young age group and 33.1 years for the late-middle age). It may therefore be possible to identify this type of friend as a person whom people have shared enough past life experiences and memories with to maintain a close relationship in spite of geographical separation.

Although the Long distance friends of the young group show similarity in many dimensions with those of the late-middle age group, there are notable differences between them. First, compared to those of late-middle age people, the Long distance friends of the young age group show a relatively moderate level of emotional closeness. The percentage of emotionally close relationships takes 57% of the Long distance friends among the young, whereas 80% of Long distance friends are described as an emotionally close person among the late-middle age group. In addition, the communication frequency and exchange of advice and confiding with this type of friend is somewhat lower in the young age group than in the late-middle age group.

### **The Long-time not close friend**

The third group of friends, which I labeled the Long-time not close friend, shows distinctive characteristics to the extent that people did not feel close to this type of friend even though they had known them for a long time (14.2 years for the young and 19 years for late-middle age) and often encountered each through living in close proximity. This type of friend is likely to be a partner for socializing or exchanging practical support, but not a person whom people can rely on for seeking advice, confiding or asking help in emergency situations. In both age groups, friendships with the opposite gender are likely to belong to this type.

Compared to the old age group, the young age people showed many notable differences in relationships with Long-time not close friends. First, most friends of this type among the young people are drawn from a childhood or adulthood relationship (84%), whereas the late-middle age people met this type of friend from their workplace, informal social organization, neighborhood, or through others. Second, the emotional attachment to this type of friend is a bit higher among the young age people. About half of the Long-distance not close friends were named as an especially close person among the young age group, while only 24% of emotionally close friends were assigned as this type of friend in the old age group. Third, young people are more likely than the old age people to socialize with this type of friend. Among the young, the Long-time not close friend has a 67% chance to be listed in the socializing activity, whereas this represents 45%

among the late-middle age group. Lastly, the overall proportion of Long-time not close friends is substantially higher among the old age people than in the young age group (24.4% of the late-middle age, and 14.1% for the young age group).

### **The New friend.**

The last group of friends shows the shortest relationship tenure and lowest emotional closeness of any type of friend. I labeled this class of friends as the New friend. In both age groups, people often meet and communicate with this type of friend and exchange practical help. However, their relationship is shorter than 3 years among the young and 6 years among the late-middle age group on average. Further, people are less likely to list this new friend as an emotionally close friend. Compared with other types of friends, the class of New friends contains more heterogeneous relationships in age, gender and race/ethnicity.

The proportion of New friends in overall friend groups is substantially higher in the young age group (43.3%) than the old age group (27.9%). Young people are likely to meet this type of friend in college or the workplace (47%) or informal social organization (23%), whereas New friends of the old age people are likely to be drawn from a relationship they formed in an informal social organization or neighborhood (42%) or through others (32%). Another interesting difference between the two age groups is that the New friends of the young age group include more friendships with different gender and race, whereas age heterogeneity of New friends is more salient among the old age group.

### **Intra-correlation**

In addition to the detailed characteristics of each friendship type, the young and old age groups also show a difference in the intra-correlation coefficient (ICC). The ICC score indicates how much respondent-level contexts take account of the variances of tie level differences. As shown in Table 3.2, the most of the differences between the Active friends and Long-distance friends are explained by the tie level characteristics in both age groups (ICC is 2.74 for the young age group and 3.19 for the old age group). It indicates that most of the differences between these two types of friends are likely derived from relationship contexts (i.e., the geographical distance) instead of individual-level variances.

**Table 3.2.** Intra-Class Correlations by Age groups

	Intra-class correlation	
	Young	Old
Active vs. Long-time not close friend	34.62%	30.18%
Active vs. Long-distance Friend	2.74%	3.19%
Active vs. New friend	3.05%	34.94%

Simultaneously, about one-third of variances between Active friends and Long-time not close friends were explained by individual-level characteristics. Although both types of friends live nearby and respondents had known them for a relatively long time, the Long-time not close type friends originated from different contexts, were less emotionally close, and less active in social exchanges compared to the Active friend type. This means that people interact with these two types of friends in similar geographic areas but their ways of interaction are different. This

difference is to some degree due to the individual's current life conditions or personal characteristics.

Unlike the young age group, the ICC score between the Active friend type and the New friend type among the old age group is substantially high. About 35% of the variance between the Active and New friend types is explained by individual-level characteristics, while only 3% of the variance between the two types of friends is dependent on ego-level characteristics among the young age group. This may imply that the chance to meet and build a friendship with newly met persons becomes more dependent on the individual's life contexts as affected by ageing.

### **Marital and Employment Status and Types of Friends**

The above analyses show that alters named as 'friends' in fact are composed of four different types of relationships. Do people have similar types of friends regardless of their marital and employment status, as with the number of friends? Or do the distributions of the four types of friends in personal networks vary according to marital and employment status? In this section, I examined this question by estimating the effects of marital and employment status on friendship ties' membership probabilities of each type of friend group and net of other control variables. The results are presented in tables 3.3 and 3.4 (the full results are in the Appendix) and Figure 3.3 to 3.6. The coefficients of each model were estimated with the effect coding scheme, which represents the degree of deviance from the overall average instead of from the reference category (Vermunt 2005).

#### **Young Age group**

In Table 3.3, the magnitudes of coefficients seem to suggest differences of friendship composition according to marital status and employment status. For example, friends of married young people have more chance of being assigned into the Long-distance friend type or Long-time not close friend type than average. Their chance of belonging to the Active or New friends type is lower than average. As for employment status, the friends of students group shows a higher chance of being assigned into the Active friend type than average. However, the marriage and employment status variables failed to gain statistical significance.

This may be mainly due to the limitation of the age range this data covered. A range of 20 to 30 years old may not be broad enough to show the variance of friendship type according to marital and employment status. Most of the young respondents in the data, for example, still had unmarried status (only 11.1% of cases reported they were married). Even among the married young people, their marriage may not have been long enough to be a factor on their friendships. In the same sense, the fully employed young people were still in the early stages of their working career. It can therefore be inferred that the duration of marriage and employment of the young respondents may not have been long enough to show an effect on the interaction with their friends. The invariance of friend types was also confirmed by the intra-class correlation presented in Table 3.4, which indicates the proportion of variances between each type of friends accounted for at the respondent level. For example, only 3.1% of the total variance between the Active friend and the New friend type was explained by respondent level characteristics. Except for the comparison between the Active and Longtime friends, ICC scores between other pairs of friend types were substantially small. This may imply that the variances of life contexts among

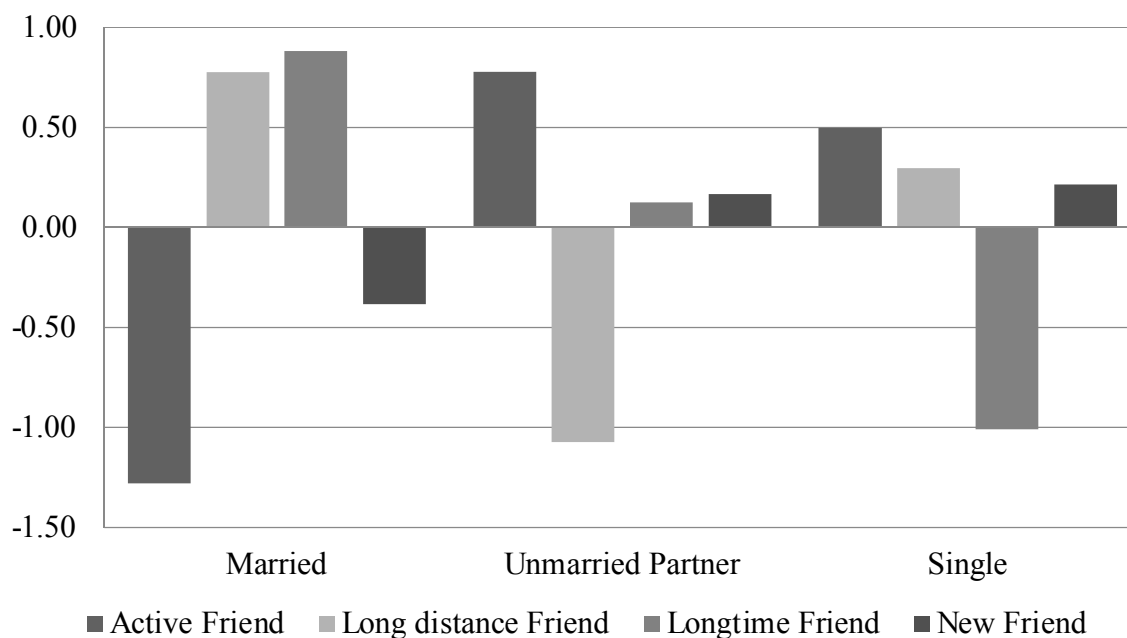


the young age people, particularly in their 20s, may not be material enough to influence the variance of friendship network compositions.

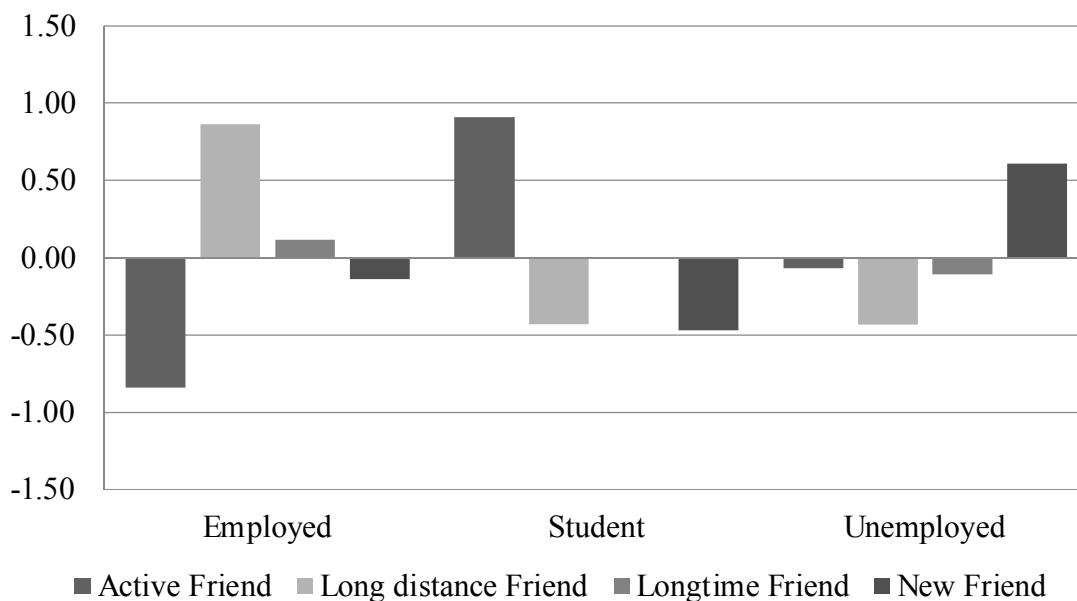
**Table 3.3.** Estimating Class memberships: Young Age Groups

Young	Active Friend	Long-distance Friend	Longtime Friend	New Friend
Age	0.06 (0.16)	-0.25 (0.20)	0.31 (0.21)	-0.13 (0.14)
Married	-1.28 (0.73)	0.78 (0.88)	0.88 (1.17)	-0.38 (0.76)
Unmarried	0.78 (0.57)	0.30 (0.79)	-1.01 (0.82)	0.22 (0.55)
Partner	0.50 (0.56)	0.30 (0.63)	-1.01 (0.76)	0.22 (0.56)
Single	-0.84 (0.65)	0.86 (0.65)	0.11 (0.73)	-0.14 (0.53)
Employed	0.91 (0.52)	-0.43 (0.58)	-0.01 (0.71)	-0.47 (0.47)
Student	-0.07 (0.66)	-0.43 (0.69)	-0.11 (0.76)	0.61 (0.54)
Unemployed				

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$



**Figure 3.3.** Effect of Marital Status on Friendship types by Marital Status: Young Age Group



**Figure 3.4.** Effect of Employment Status on Friendship types by Marital Status: Young age group

### The Late-middle age group

Unlike the young population, the distribution of the four types of friends significantly differed according to the marital status of late-middle age people. The married old people had more Longtime friends and less Long-distance not close and New friends. In contrast, the singles had more Long-distance and New friends and less Longtime not close friends. The Active friends, however, did not significantly vary according to marital status. Firstly, this result implies that old people keep their relationship with Active friends regardless of their marital status. As expected from the convoy model (Antonucci and Akiyama 1985), there are a group of friends, at least among the old age population, who may be less likely to fluctuate according to individual social conditions. Secondly, however, other types of friends are likely to vary by marital status. Compared with the married people, the singles had a substantially lower proportion of Longtime friends in their networks, whereas New friends comprised a higher proportion among the singles. Since more than 65% of the single people were divorcees and widowers, the difference between the married and single would derive from the broken marriage. Regarding the fact that the Longtime not close friends were not emotionally close and about 70% of these relationships were formed in a social organization or neighborhood or from meeting through others, this type of friend is highly likely to be shared with the person's spouse or partners. If so, the lower proportion of the Longtime not close friends among the singles can be interpreted as people being highly likely to drift apart from the shared Longtime not close friend after they lost the relationship with their spouse. After the broken marriage, people may try to reconstruct their social relationships under new life conditions. This may have a consequence on the increasing proportion of the New or Long-distance friends. Another notable finding is that unmarried people who had a romantic partner were likely to show similar patterns of distribution of the four types of friends to married people. Compared with the singles, they were likely to have more

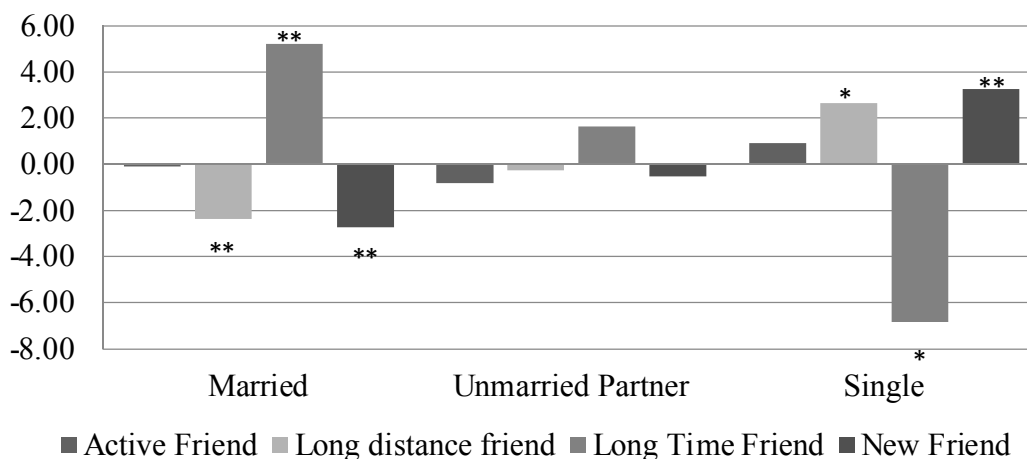
Longtime not close friends and a small number of Long-distance and New friends. It implies that unmarried partners may play similar roles as spouses among the old people.

Employment status also significantly differentiated each friend tie's probability of being classified into the four types of friends among the old people. As in the case of marital status, the variance in the Long-distance, Longtime and New friends was substantially accounted for by the employment status, while the proportion of Active friends was not significantly varied by employment status. The employed were likely to have more Longtime not close friends and less Long-distance and New friends than the average. At the same time, the retirees were likely to have more New friends than average. The high proportion of Longtime not close friends among the employed old age people may be understood as working old people having a group of friends whom they met through their job and exchanging useful help related to their particular job tasks through regular interactions over a long period of time. On the other hand, the retired may lose this type of friend after retirement. They may spend their newfound time participating in other social activities, thereby expanding the potential pool of new relationships after retirement.

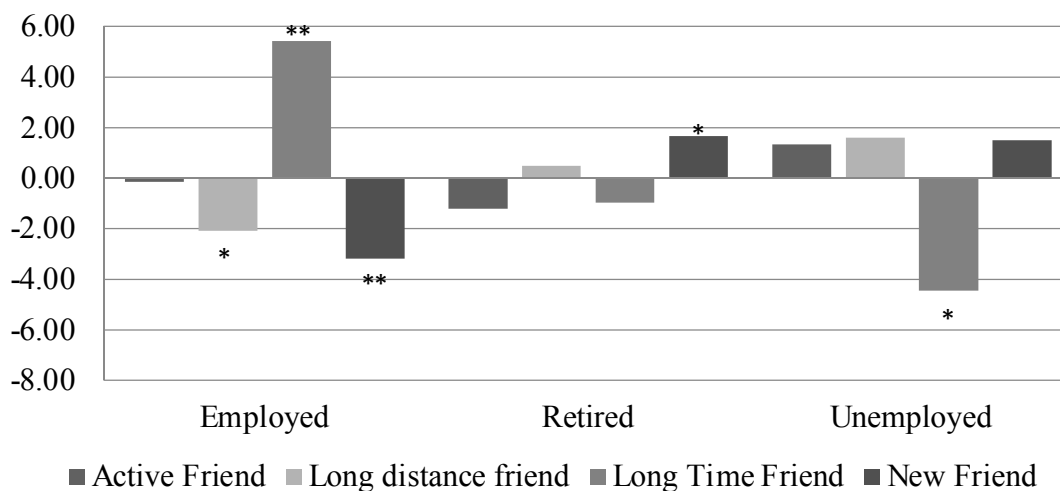
**Table 3.4.** Estimating Class memberships: Late-middle Age Group

	Active Friend	Long distance Friend	Long Time Friend	New Friend
Age	-0.11 (0.09)	-0.01 (0.10)	0.37 (0.20)	-0.24* (0.10)
Married	-0.11 (0.72)	-2.36** (0.82)	5.20** (1.93)	-2.73** (1.06)
Unmarried Partner	-0.82 (0.64)	-0.28 (0.73)	1.63 (1.42)	-0.54 (0.71)
Widowed/Divorce d/Never Married	0.92 (0.97)	2.64* (1.15)	-6.83* (2.98)	3.27** (1.27)
Employed	-0.15 (0.82)	-2.09* (0.96)	5.42** (2.06)	-3.18** (1.00)
Retired	-1.20 (0.66)	0.48 (0.64)	-0.96 (0.89)	1.67* (0.76)
Unemployed	1.35 (0.77)	1.61 (1.00)	-4.46* (2.07)	1.51 (0.82)

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001



**Figure 3.5.** Effect of Marital Status on Friendship types by Marital Status: Old Age Group



**Figure 3.6.** Effect of Employment Status on Friendship types by Marital Status: Old Age Group

In sum, marital status and employment status did not monolithically shape friendship among the old age group. The Longtime not close friends comprised a higher proportion among married and employed people, whereas the proportion of Long distance and New friends was higher among singles and retirees. In contrast, the proportion of Active friends was less influenced by marital and employment status. These results confirm that friendship and friend networks change through the life course. The change in friendship, however, mainly occurs in the certain types of friendship (i.e., Long-time not close, Long-distance and New friends), while people tended to have a similar portion of friends who were actively engaged in their life regardless their life course stage.

## Discussion

To my knowledge, this study is the first attempt to incorporate the heterogeneity of friendship into an assessment of the effects of life course on friendship using quantitative survey

data. The term friend is ambiguous and covers the many different forms of relationship (Fischer 1982; Adams et al. 1998; Spencer and Pahl 2006; Ueno and Adams 2006), and the heterogeneous types of friends constitute a friendship network (Ueno and Adams 2006). As demonstrated through numerous studies, the life course and transitions of the life cycle are deeply associated with friendship networks. Some types of friendships would be dramatically changed by the transition of life stages, whereas other types would be relatively constant in many ways under a change of life course (Antonucci and Akiyama 1987; van Tilburg 2003). What types of friends, then, do people have? Further, what types of friends are more likely to be influenced by the current life stage than other types of friends? This study attempted to answer these questions by inductively determining multiple types of friends and testing the effects of marital and employment status on the distribution of heterotypic friends in personal networks using rich ego-centric network survey data.

In order to determine the multiple types of friends, I focused on the multiple elements of friendship and their interdependent structure. By assessing the distinctive patterns of association among multiple elements of friendship, this study found that young and old age people have four different types of friendship: the Active friend, the Long-distance friend, the Longtime not close friend, and the New friend. In the population aged 50 to 70 years old, married and employed people are likely to have more Longtime not close friends than average, whereas the proportions of Long-distance friends and New friends are significantly lower than average.

First of all, the results of this study confirm the main idea of previous friendship studies that the term of friends covers multiple forms of social relationships (Fischer 1998; Spencer and Pahl 2006; Ueno and Adams 2006). While the inductive typological approach has been applied in some studies using in-depth interview data, quantitative survey data, to my knowledge, has never been used for mapping out multiple types of friends in spite of their rich information on social relationships. By suggesting practical ways to build up the typology of friendship using social network survey data, this study not only reveals multiple types of friends but also contribute to opening an empirical method of incorporating the diversity of social relationships including friendships into quantitative studies of social relationships and networks.

Secondly, this study contributes to widening the scope of life course and personal relationship literature. Despite the rich set of accumulated results in life course and social relationship studies, one rarely tested question is what types of friendship are more vulnerable to the changing of life contexts than others. One of the widely applied frames for classifying social relationships in life course literature is to classify social relationships into two groups: core and peripheral social relationship. The convoy model, for example, demonstrated the core social relationship as a stable and influential group of people in personal networks. The convoys are usually less affected by the transition of life stages and constantly exchange support with each other while marching through the life trajectory (Antonucci and Akiyama 1987; Antonucci et al. 2013). The Active friend group in this study fits this conceptualization of convoy. A person has known this type of friend for a long time (more than 5 years for the young age group and more than 20 years for the late-middle age group). They engage in various forms of social exchange with intense communications and strong emotional attachment. Compared to core members of networks, however, peripheral relationships still remain as a gray area. Within the peripheral area of social relationships, different types of relationships coexist. Some of the peripheral friends are clearly opposed to the core friends in terms of what they are: new, specialized for a certain exchange, and less firm. On the other hand, other types of friends, for example, Longtime not close friends in my results, may be treated as peripheral friends to the extent that they are not

emotionally close and less active in exchanging social services and resources. However, this type of friend has a long relationship tenure, as those of the convoy groups. They also seem to address the challenges of life together. This type of peripheral group may play different roles in an individual's life compared with other peripheral relationships as well as convoys.

This study attempts to incorporate several dimensions of friendship and their corresponding measurement into its empirical analysis. However, limitations of this study should be noted here for future research. Firstly, the individual's moral perspective toward their friends needs to be considered. Although friendship itself is less regulated by strong norms or moralities compared other social relationships such as family or coworker, a part of the individual's demonstration of their particular friendships relies on virtues such as loyalty, honesty, truthfulness, and egalitarian reciprocity (Spencer and Pahl 2006; Policarpo 2015). These normative dimensions may reflect an individual's general expectation of friendship, which in turn helps in understanding part of the normative definition of friendship in our current society. Although this study's main focus is neither specifying a single definition of friendship nor determining the general expectations of friendship, future research on friendship based on the results of this study will be able to expand on this to pursue a comprehensive understanding of friendship dynamics and complexity by incorporating the normative sentiments of a given friendship.

Second, although I have showed the significant differences of friendship according to life stages, this study did not directly examine the change of friendships along with the transition of life stages. However, the results imply a trajectory of friendship progression. All types of friends have been a new friend at a certain point. Some of them might have developed as a close friend (i.e., Active friendship or Long-distance friendship in this study), and others might either remain as not-close friends (i.e., Longtime friendship in this study) or recede. Some Long-distance friends might have been Active friends before they were geographically apart from each other. The question is, then, which life cycle transitions and relevant life events affect the transforming of the types of friendships, and how. The dynamics of the friendship process is not merely the ebbs and flows of relationships. Rather it is a complicated transforming process of the nature of the relationship. A remaining question is how the multiple types of friendship change and what social contexts shape the various directions of changing friendships. With longitudinal data, future research can demonstrate the different trajectories of the friendship process, and test the effects of life course events on these transforming friendships.

## Chapter 4

# With Whom do older adults do what and how does that change with aging?

### Introduction

Longstanding gerontological and sociological studies have dealt with how old adults maintain their social integration under the age-related change of their life conditions. To the extent that preserving social integration, and thus, achieving successful aging, is heavily associated with old adults' social relationships, it is important to understand how old adults' social relationships change during and after the life transition to the late life stage.

Current research on the elderly's personal networks has been improving our understanding of the complex changes of social connectedness of old adults over the aging process. Through a rich set of previous empirical studies, we have determined that old people's social networks are smaller and more concentrated on kin and intimate relationships than those of the young population (Marsden 1987; Morgan 1988; Bosse et al. 1993; Krause 1999; Shaw et al. 2007; Cornwell, Laumann, and Schumm 2009). However, prior empirical network studies have paid less attention to the age-related changes of specific relationships in the personal networks. The life course transition and aging process are not only related to the structural changes of overall personal networks, such as the average number and frequency of contacts, but they also induce the changing of interaction dynamics in a specific social relationship (Stueve and Gerson 1977; Schulz and Tompkins 1990). Given the changes in personal and social conditions, old adults may have to or attempt to preserve or alter the way of interaction with a specific network member to meet their everyday needs. They may maintain a similar activity with the same person who used to be a partner in that activity before or may rely on a different person who used to interact in different ways for a certain activity. Although we have learned the details of changes in personal networks from previous empirical evidence, usually derived from the personal network level, less is known about how old adults adjust their interaction dynamics with a specific network member, which requires a social tie-level approach.

Many classic theories in sociology and gerontology have provided insights into the changing of interaction activities in relation to a specific social tie. Against disengagement theory, which asserts that old adults gradually withdraw from most social interaction with age, scholars have highlighted the adaptability of old adults. They argue that old adults adapt new life conditions by adjusting their social interactions. Old adults may continuously exercise similar interaction styles to maintain their internal integrity and coherent approval from their interaction partners (Atchely 1989). Alternatively, they may devote more time and energy to emotionally rewarding interactions than younger people do (Carstenson 1993). While relatively few empirical

social network studies have taken the idea of adjustment of social interaction to test the change of specific social ties with aging, from the idea of adaptability, one can expect that some of the social contacts in personal networks may constantly serve similar activity roles, while others may interact with old adults through different activities along with the aging process

Drawing theoretical implications from previous theories and taking a tie-level approach using the currently developed multilevel clustering method, this study aims to examine the question of which individuals old adults spend time with, what activities they engage in, and how this changes with age. As clarified below, I find that social ties are distinctively classified into six different social exchange patterns and the distribution of social exchange patterns of social ties is relatively stable across ages. However, the social exchange patterns of some social role relationships, specifically, those of parents, children, siblings, workmates, and organization members differ across age, while those of spouses/romantic partners, friends, and neighbors are relatively stable in their social exchange patterns.

### **Change of social networks over the life course**

The change of social networks over the life course is a multifaceted phenomenon. Social network size and the average volume of contacts with network members, in general, decreases with age. Moreover, people gradually drift away from non-family members and are less emotionally bonded via social ties as they age (Marsden 1987; Morgan 1988; Bosse et al. 1993; Krause 1999; Shaw et al. 2007; Cornwell, Laumann, and Schumm 2009). In contrast, old people interact more frequently with close relatives and friends (Antonucci and Akiyama 1987; Morgan 1988; van Tilburg 1998; Schnittker 2007). Meanwhile, studies focusing on social support have revealed that emotional support ties are relatively stable across age (Carstensen 1992; Shaw et al. 2007). Furthermore, from a 10-year follow-up study, Matire and her colleagues (1999) found that not only emotional support but also informational support is relatively constant.

The change of social networks across life stages has usually been accounted for by the structural change of life contexts and individuals' choices related to interaction partners in response to changing life conditions. With the concept of the structural changes of the life condition with aging, scholars have suggested that life course factors, such as retirement, bereavement, or widowhood, induce change in individuals' personal networks by altering the opportunity structure of social interactions. For example, after retirement, the social life of retirees tend to be constructed around informal social areas where people encounter their family members, intimate friends, or neighbors more frequently than they used to do. The change of life foci from the workplace to informal social areas after retirement also leads to a decline of non-closed social ties, particularly, those of co-workers (van Tilbuge 1992, 2003).

Some social psychologists have highlighted the different psychological preferences in relation to social interactions between young and old populations. For example, Castensen (1992) argued that, compared with young people, old adults tend to look for more emotional rewards from their social interactions instead of informative benefits. This preference for emotional support, in turn, raises the proportion of intimate family members or emotionally well-bonded persons in old adults' personal networks (Castensen 1992).

Although the two perspectives on the life course and social networks suggest apparently different mechanisms of social network change over the life course, both the structural and psychological points of view built their arguments based on the same ground—the individual. The structural argument explains the change in social networks by focusing on the change of



opportunity structure in which the retirement person is embedded. Psychological view also accounts for the increasing proportion of intimate network members in the old population by focusing on the changing needs of the person who is becoming old. Yet, both perspectives leave some questions open: What if the opportunity structure of the new life context does not support a relationship with a certain person? What if some of the old person's intimate network members still want informational support rather than emotional support? The limitation of both perspectives, I argue, is that they pay far less attention to the change of dyadic social relationships than the change of individual social networks.

As discussed above, social networks change in multiple directions. The multifaceted aspect of network change partly occurs because the social network comprises various social relationships. Moreover, each of these social ties within a social network is embedded in a different context and has distinct characteristics. Accordingly, the implications of life events and transitions for social relationships vary across specific relationships. For example, in their study using multilevel modeling, van Duijn and his colleagues (1999) found that the variation in the stability of the relationship over time is greater between ties than the variance between whole networks is. This result implies that the differences between ties explain more about whether a certain tie is stable over time than individual-level differences do. To understand the dynamics of social network changes across the life course, we need to ask whose relationship with the ego changes before we consider how the ego's network changes over the life course.

### **Changing social exchange**

Changes in personal networks over the life course include not only the gain and loss of certain relationships but also the change of exchange contents with network members. People exchange various social services and resources with their network members, and many network members are usually specialized for a specific social exchanging (Fischer 1982; Wellman and Wortley 1990). Considering the selective mobilization of social relationships under structural opportunity and constraint, Fischer (1982) found that urban dwellers are more likely to select non-kin relationships as a source of social supports. The selection of possible supporters for a specific task also varies according to the relational context. For example, Fischer (1982) found that spouse and kin members are likely to be called for counseling activities, whereas friends are most likely to be mobilized for socializing behaviors. From their quantitative and qualitative network data, Wellman and Wortley (1990) also found that most network members are mobilized for specific supports. The kinds of social support the alter provides depends more on the relationship characteristics with the alter, such as the strength of the tie and role relationships, than on the individual-level network characteristics (Wellman and Wortley 1990).

Although few studies have dealt directly with the changing type of social exchanges over the life course, a rich set of evidence from personal network studies implicitly demonstrates the multidirectional change of social exchanging behaviors with aging. For example, the convoy model demonstrates that a group of network members furnishes consistent supports to the ego as they move together through the life course (Antonucci 1980; Antonucci and Akiyama 1987). This core group is relatively stable (Shulman 1975; Antonucci and Akiyama 1987; Carstensen, 1992; van Tilburg 1992 and 1998); the group members constantly exchange multiple types of supports with each other throughout the life course. The idea of a convoy or core members of social networks implies that, to some degree, old adults interact in familiar ways with familiar members. In contrast, people also change their ways of interacting and exchange contents with

some of the network members during aging. In their Scripps Foundation Studies of retirement, for example, Atchley and his colleagues (1971) found that retired adults maintained their relations with some of their workmates who also retired (Atchley 1971). After retirement, old adults may maintain their relationship with their workmates by replacing work-related activities with leisure or volunteering activities. Changes of exchange contents of retirees with their network members are also found in their relationships with their adult children and friends. Van den Bogaard, Henkens, and Kalmijn's (2014) recent study using the Netherlands Kinship Panel Study showed that retired parents are more likely to give practical help, such as performing household chores, to their children and friends. Although we do not know what types of activities they did with their children and friends before retirement, this result implies that the ways of interaction with children and friends are replaced with exchanging instrumental help.

In short, given the complexity of social network change associated with the aging process, we still know little about tie-level changes in the contents of social exchange. The remaining question in studies about old adults' personal networks is as follows: What activities do people do together, whom do they do them with, and how does this change with aging? The analyses in this study attempt to delineate the multiple patterns of changes in pairs between the alter and social exchange activities.

### **Data and Methods**

This study uses the data from the ego-centric social network survey (UCNets) conducted between 2015 and 2016 in a large metropolitan area on the west coast of the United States. The study population related to the UCNets data was defined as two distinctive age groups (20–30 years old and 50–70 years old). The respondents were sampled using a three-stage process. First, 30 census tracts were selected that were proportional to the population, and households were randomly sampled using the full list of mailing addresses in each census tract. Second, solicitation letters invited any member of the sampled household who was qualified by age to participate in the survey. Third, the recruited participants were interviewed via either a face-to-face interview (75%) or web survey (25%). Ultimately, 674 old (50–70 years) and 485 young (20–30 years) participants completed the survey.

The UCNets data collected diverse information about both the respondents and their social network members. At the respondent level, the survey covered their sociodemographic characteristics, life events, physical and mental health status, and social network aspects. Especially, several name-eliciting questions asked respondents to list their social network members who engaged in several social activities. In addition, their spouses, romantic partners, and household members were added to the list of personal networks. Based on this list, the survey asked a set of name-interpreting questions that provided a variety of tie-level characteristics such as the basic description of relationships, contact frequency, emotional bonds, geographical proximity, and so on. For the purpose of current research, I choose respondents from the old age sample aged 50–70 years and their alters. Among the alters, I exclude cases where their characteristics are not fully answered or they are not listed for any social activities. In addition, a few alters in the respondents' personal networks are professionals, such as medical doctor or therapists; I exclude professional ties to narrow the focus to private relationships. The final study case comprises 671 respondents and 6,219 social ties.

### **Social Exchange Activities**

The UCNets survey asked respondents to list specific names of people with whom they engage in six different types of social activities—socializing, discussing a personal matter, seeking out advice on an important decision, obtaining practical help, obtaining emergency help when they are sick, and providing help. Table 4.1 shows the specific questions for each activity and percentage of alters who were mentioned for each question. For example, 60.07% of the alters were listed as partners for socializing activities, such as going out for shopping or dinner. Moreover, 18.33% of the alters were mentioned as people who had provided practical help to the respondents during the few past months.

**Table 4.9.** Six social exchange activities and percentage of alters mentioned in each question

Social Exchanges	Questions	Distribution
Socializing	<i>Please think about people you typically do these sorts of things with – or other social things as well, such as going shopping, out for drinks, to the park, or just hanging out. Who are the people you usually do these sorts of things with?</i>	60.07%
Confiding	<i>Who do you confide in about these sorts of things?</i>	33.46%
Advising	<i>When you have to make important decisions – for example, about taking a job, family issues, or health problems – whose advice do you seek out</i>	27.71%
Receiving Practical help	<i>In the last few months, have any friends, relatives, or acquaintances who do not live with you given you any practical help like moving furniture, doing repairs, picking up something at the store, looking after a child, giving you a ride, or things like that?</i>	18.33%
Receiving Emergency Help	<i>If you were seriously injured or sick and needed some help for a couple of weeks with things such as preparing meals and getting around, who would you ask?</i>	32.03%
Help out	<i>Who are the people that you help out practically, or with advice, or in other kinds of ways at least occasionally?</i>	41.57%

### Covariates

The UCNETS survey asked several name-interpretation questions to describe the relationships between the respondents and their network members. The respondents identified role relationships with specific alters using 14 categories, ranging from “spouse” to “other.” I recategorize the role relationships into the 10 following categories: “Spouse/Romantic Partner,” “Children,” “Parents,” “Siblings,” “Other Relatives,” “Neighbors,” “Workmates,” “Organization Mates” (i.e., church or social club), “Friends,” and “Acquaintances.”<sup>1</sup> Three other name-

<sup>1</sup> A couple of points should be noted: First, in the original survey, the respondents were allowed to identify their alters with more than one role relationship (e.g., other kin as well as organization member). When multiple role

interpretation binary questions were included in the analyses, specifically, emotional closeness, same gender, same age, and geographical proximity. In addition to the tie-level covariates, I used respondents' age information by dividing them into four age groups with 5-year intervals (50–54 years, 55–59 years, 60–64 years, 65–70 years). Table C.1 presents detailed descriptive statistics of the covariates in this study.

### **Analytical strategy**

The main issues of this study were which social contacts old adults spend their time with, what activities they carry out, and how this changes. This study question consisted of three sub-elements, namely, social exchange patterns of alters (for the activities), characteristics of alters (for the social contacts), and the change in the social exchange patterns of alters (for the change). Corresponding to these sub-elements, I conducted three steps in the analysis: First, I figured out countable and distinctive social exchange patterns of alters using multilevel clustering methods. Second, I added tie-level characteristics into the model for estimating the membership probability of each cluster derived from the first stage. Using the results from the second step analysis, I described the general characteristics of the alters in each specific social exchange pattern. Third, by repeating the first step analysis for different age groups, I demonstrated the different distributions of social exchange patterns, as well as the different distributions of social exchange patterns in role relationships by age. Below, I discuss each analysis step in more detail.

Social exchange patterns of alters in this study refer to a set of social exchange contents that a specific alter provided to respondents. However, capturing the patterns of social exchange patterns of alters is challenging due to the subjectivity and multiplexity of social exchange, as well as the methodological challenge posed by the multilevel structure of personal network data. First, some of network members engaged in multiple social exchange activities. People may do several activities (e.g., socializing, seeking advice, exchanging support, etc.) with one person (e.g., spouse or romantic partner) but interact with another person (e.g., personal doctor) in a single specific activity (e.g., receiving health-related advice from their personal doctor). One of the main characteristics of convoy network members is a set of alters engaged in multiple social exchange activities (Antonucci and Akiyama 1987). In their study on friendship, Spencer and Pahl (2006) classified it by considering both the contexts and number of social exchanges that each friend engaged in. Their typology of friendship differentiates friends not only between a group of friends who provide multiple social services and friends who are specialized for a single activity, but it also distinguishes friendship among the friends that provide a single social service,

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categories overlapped in one relationship, I choose the kin relationship if it overlaps with other categories. Otherwise, I choose the most specific context of the relationship (e.g., workmate > friend). Second, I merged “spouses” and “romantic partners” into one category. While these two relationship indicate apparently different relationships, my preceding analysis (not reported in this article) showed that they are almost identical in activity involvement, emotional attachment, and proximity. Thus, for conciseness, I treated them as one category. Third, step-relationships are merged into the corresponding category (step-parent in the parent category, step-siblings in the sibling category, etc.). Fourth, in the original survey, the “other” category was included in the relationship question. When certain social ties were described as “other,” the survey asked the respondents to specify the relationship using an open-ended question. By assessing the respondent description of “other” relationships, I reassigned those ties to given relational categories. Some “other” relationships are professionals, such as “personal medical doctor,” “nurse,” “housing manager,” or “financial consultant.” To focus on private relationship, I excluded them from my analysis. In addition, the original question had a “schoolmate” category, but its proportion among the old sample is less than 2%, and most respondents were not in school at the time of the survey. Thus, I merged this category with the “friends” category.

such as amusement friends (specialized for socializing) and confidants (friends specialized for confiding; Spencer and Pahl 2006). The multiplex nature of social relationships requires considering not only of the types of social exchanges but also how those exchanging activities overlap in a single dyadic relationship. In this regard, the present study operationally defines the social exchange activates as a combinational pattern of multiple types of social exchanges. The main idea is that providing practical help and being a socializing partner is a different pattern of social exchange from both only providing practical help and providing practical help and being a confidant. However, logically, the number of possible combinations between types of social exchanges is innumerable.

Second, since alters are nested among respondents in our survey data, the pattern of social exchanges of a specific alter may strongly correlate with those of other alters in the same personal network. This dependency of alters in a single network may cause some biased results unless accounting for the hierarchical structure of the data (Snijders, Spreen, and Zwaagstra 1995; Duijn, Busschbag, Snijder 1999).

To overcome the multiplexity of social exchange of alters and multilevel structure of personal network data, I employed the multilevel latent class (MLLC) model. The MLLC is an extended version of latent class analysis (LCA), a statistical method for reducing the observed association among manifested indicators to countable subclusters, so-called latent classes (Lazarsfeld 1950; Goodman 1974; McCutcheon 1987). The MLLC modified the traditional LCA by incorporating the dependency of observations that usually occurred in the nested data structures (Vermunt 2003). When performing LCA with nested data, the dependency between level-1 units (e.g., students) drives some of the parameters for estimating subclusters of lower level units to vary across upper level units (e.g., schools). The basic idea of MLLC is to allow parameters to differ across the level-2 units instead of assuming that the model parameters are equal for all level-2 units (Vermunt 2003). At the same time, the MLLC model allows regressing the distribution of the latent classes of level-1 units on a set of covariates both from the lower and upper levels. By using the MLLC, the first step of analysis of this study extracts a countable number of “social exchange patterns” of alters from six observed activities as the accounting dependency of alters.

Based on the results from the initial step analysis, I added tie-level binary covariates (e.g., emotional/geographical closeness, same age/gender, role relationship) into the extended MLLC model, referred to as the *three-step model*, to describe the general characteristics of each activity involvement pattern group. The three-step model is designed to estimate the effects of a set of covariates on the distribution of latent classes derived from a simple latent class model (Vermunt 2010). By regressing tie-level attributes on the probability of being assigned in each subcluster, the MLLC model provides more detailed descriptions of characteristics of ties in each “social exchange patterns” group.

To understand the differences in the alters’ social exchange patterns with aging, I implemented the same models (e.g., three-step latent class model) separately for each age group. Such results can show a change in the overall distribution of each activity involvement pattern group across age groups. Furthermore, this analysis allows testing whether and how each role relationship’s social exchange patterns differ with age.

In this study, I presented and interpreted the results from MLLC in two ways, namely, interpreting estimated probabilities of social exchange and the tie characteristic variable in each latent group and explaining the estimated proportion of latent groups in the role relationship. While both values were derived from the same estimated parameters, I selectively choose either

of them based on the explanatory purpose. Especially, I present and interpret probabilities of variables within a latent class for describing general characteristics of social exchange patterns, whereas the distribution of latent classes in a specific role relationship is shown and explained to describe the change of social exchange patterns of each role relationship with aging.<sup>2</sup>

## Results

The empirical testing in this study began with MLLC analysis to cluster social ties into distinctive “social exchange pattern” groups based on six social exchange activities. The final MLLC model in this study assigned 6,219 alters into six distinctive latent classes according to the pattern of engaging in different social analysis behaviors. I chose the six-group model based on goodness-of-fit criteria (e.g., BIC, L2, and classification error index) and interpretability, as presented in Table C.2.<sup>3</sup>

### Social exchange patterns of social ties

Table C.3 and Figure 4.1 present the conditional class probabilities from the MLLC, which indicate the probability of participating in each of six exchange behaviors conditional on latent group membership. Alters in three classes were likely to show multiple activities involvement, whereas alters in another three classes seemed to be specialized for a single activity. Based on the conditional class probabilities, I labeled the six classes as follows: “Multiple Involvement,” “Help Exchange,” “Socializing,” “Counselling,” “Help Receiving,” and “Practical Help Providing.” In addition to the distribution of the conditional probabilities of the six exchange activities, several tie attributes were also differently associated with each of the latent classes as shown in Table C.4 and Figure 4.2. These values suggested an overall characteristic of alters in

<sup>2</sup> When assessing the age differences in specific role relationships’ activity involvement patterns, it should be considered that the proportion of a latent group in certain role relationships (and vice-versa) is partly affected by its marginal distribution in each age group. For example, when the socializing group indicates 10% siblings in both the age groups of 50–54 and 65–70 years, it does not necessarily mean that egos keep their relationships with their siblings via socializing activities. If a total number of siblings in the older age group is significantly smaller than that of the younger age group due to the bereavement of siblings, this exemplary case implies that older people are more likely than younger people are to socialize with their siblings. To present the trend of changes of role relationships’ social exchange patterns as controlling the marginal distribution, I plotted the joint probability of specific activity involvement patterns and relational roles instead of true percentages. The joint probability is equalated to the ratio of observed frequency over the expected frequency in two-way cross tables. Thus, the joint probability can show how the probability of pairing certain relational roles and activity involvement patterns is far above or below from the expected probability from the marginal distribution of both categories in each age group. While I mainly interpret the results using true percentage value for intuitive purposes, this interpretation is only for meaningful findings based on assessing the joint probabilities, which are plotted in Figures 6 and 7.

<sup>3</sup> Although the BIC scores of the nonmodified models in Table 1A indicate that model 7 is better than model 6, among the modified models, the six-class model is better than any other models in terms of the BIC and classification error score. Model modification in this study is done by allowing local dependency among some of the observed variables. The latent class model assumes that all dependency among observed variables is derived from latent unobserved variables. Thus, when latent variables are parameterized, the observed variables are supposed to have no association with each other. However, in practice, the conservative application of independence assumption sometimes severely affects the fitness of a certain model. Thus, to improve the fitness of the models, allowing dependency between some of the observed variables has been suggested (Vermun 1997). A set of pair of observed variables that most severely influenced on the fitness of model can be detected by examining the bivariate residuals after the initial model has been estimated. Using the bivariate residual values, I modified each model by allowing dependency of some pair of observed variables that have the largest residual.

different activity groups. Also, Table C.5 and Figure 4.3 and 4.4 present the distribution of attributes and role relationships across the six classes of alters.

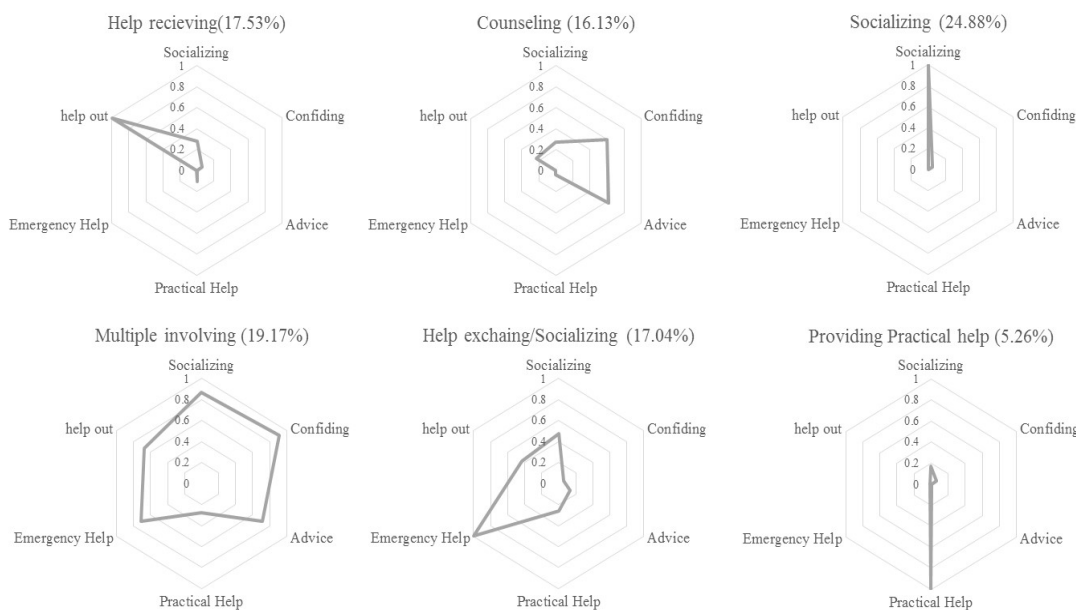


Figure 4.1 Ties' Six social exchange patterns

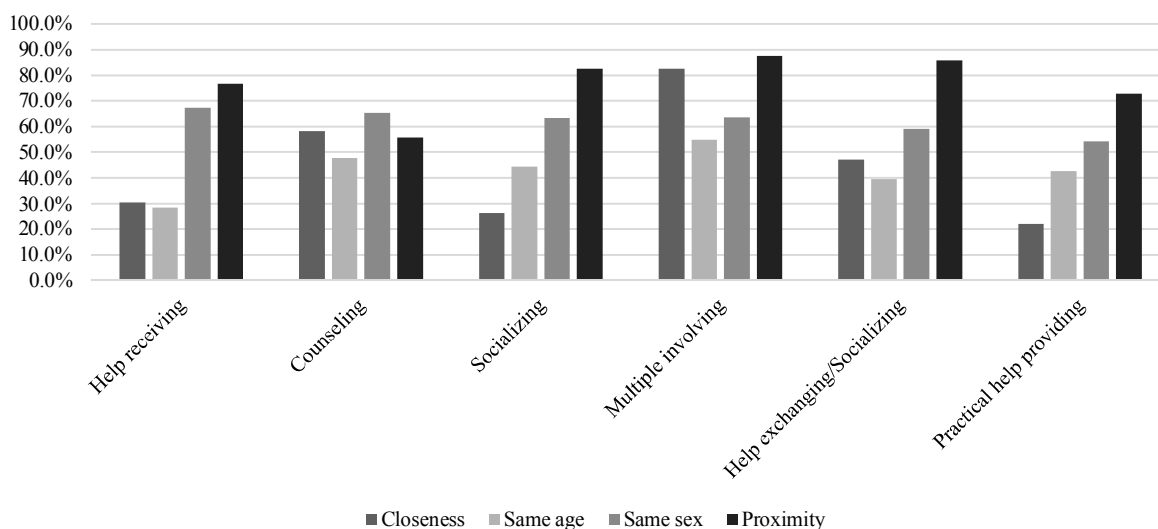


Figure 4.2 Characteristics of six social exchange pattern groups

**“Multiple Involvement”**: In the results, 17.53% of alters had more than about 70% conditional probability of being involved in most exchanging activities with the respondents, except practical help. I labeled this group “Multiple Involvement.” Members in this group were likely to be people whom the respondents sought to socialize with, obtain advice from, or confide to. In addition, the respondents expected to receive help in emergency situations and provide practical aid to them. They were usually emotionally and geographically close to the ego. As for the role relationships, about 70% of spouses or romantic partners were assigned to this

group, while a moderate number of child and siblings (20.07% of children and 21.94% of siblings) belonged to this group.

**“Help Exchange and Socializing”:** Other multiple-activity-exchange alters comprised a group of alters to whom the respondents provided aid, expected to rely on in an emergency, and socialized with to a moderate level. Unlikely to be part of the “Multiple Involvement” group, network members in this group were less likely to be called for counseling or asking practical help. I called this group “Help Exchange and Socializing.” This group of alters represented 17.04% of all alters. The alters in this group were not necessarily emotionally close or from the same age group, but most of the ties belonging to this group lived within a 1-hour driving distance, and they were likely to share the ego’s gender. In the results, 33.22% of children, 20.02% of parents, and 23.23% of other related kin were assigned to the “Help Exchange and Socializing” group. Among non-kin, 23.53% of neighbors were likely to show this type of activity involvement.

**“Counseling”:** Alters in this group (16.13% of overall alters) had high probabilities of being named as confidant or advisor. They were likely to be emotionally well bonded and the same gender as the respondents. However, they were unlikely to be part of the “Multiple Involvement” or “Help Exchange and Socializing” group. Moreover, about 45% of alters in this group lived more than a 1-hour distance from the ego. In the results, 32.04% of parents and 36.7% of siblings belonged to this group, and among non-kin ties, 27.29% of workmates and 23.12% of organization mates were likely to function as advisors or confidants. While, in the first two multiple activities groups, kin ties were more likely than non-kin ties to be evident, alters for advising and confiding activity seemed to be mixed between kin and non-kin ties. Within kin ties, the respondents may have preferred to turn to a parent or siblings rather than their children or other relations for seeking advice or discussing personal matters. Among non-kin ties, work- or organization-related ties were more likely than mere friends to be called for advising or confiding activities.

**“Socializing”:** Unlike the three multiple social exchange groups described above, the three other groups of alters seemed to be specialized in a single activity. In the results, 24.88% of the alters were mentioned in socializing activities by the respondents, whereas their names were less likely to be listed for the other five exchange activities. Alters in the “Socializing” group were not necessarily emotionally close to the ego; only 26.5% of alters assigned to this group were emotionally close. However, many of these alters lived within a 1-hour drive (82.6%). Ultimately, 36.83% of friends, 26.87% of organization mates, and interestingly, 43.4% of acquaintances were assigned to this group. Among kin relationships, about one-third of other relatives were only mentioned in terms of socializing activities.

**“Help Receiving”:** Alters in this group were only named as a person whom the respondents usually helped out in several ways. This group of alters represented 17.53% of the overall social ties. I labeled this group “Help Receiving.” Interestingly, members of this group were not likely to have a strong emotional attachment with ego. Only 30.5% of alters in this group were identified as emotionally close alters by the respondents. Another apparent characteristic of this group is that they are likely to be of a different age than the ego. Alters the respondents tended to help out without involving them in other activities were likely to be family members like parents (23.29%), children (20.26%), and other relatives (22.47%). Among non-kin, 25.21% of neighbors, 23.58% of workmate, and 21.71% of organization mates were assigned to this group.

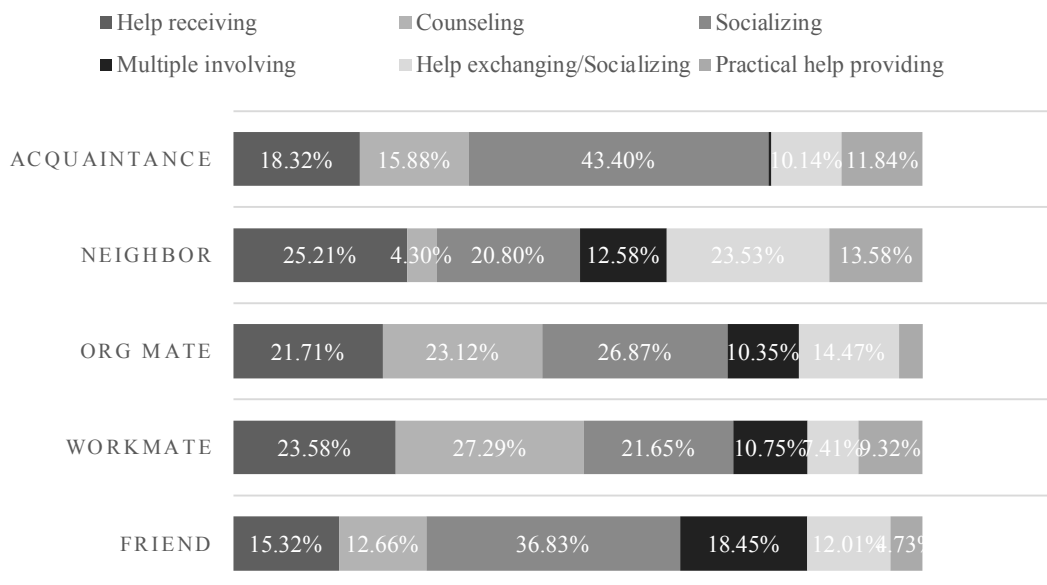
**“Practical Help Providing”:** Only 5.26% of alters were listed as persons the respondent received practical help from. This group of alters showed the lowest emotional attachment with the ego, but most of them lived within a 1-hour distance by car. As for the role relationship, other



relatives, workmates, neighbors, and acquaintances were likely to belong to this group (8.08%, 9.32%, 13.58%, and 11.84%, respectively).



**Figure 4.3** Distribution of activity involvement groups among kin relationships

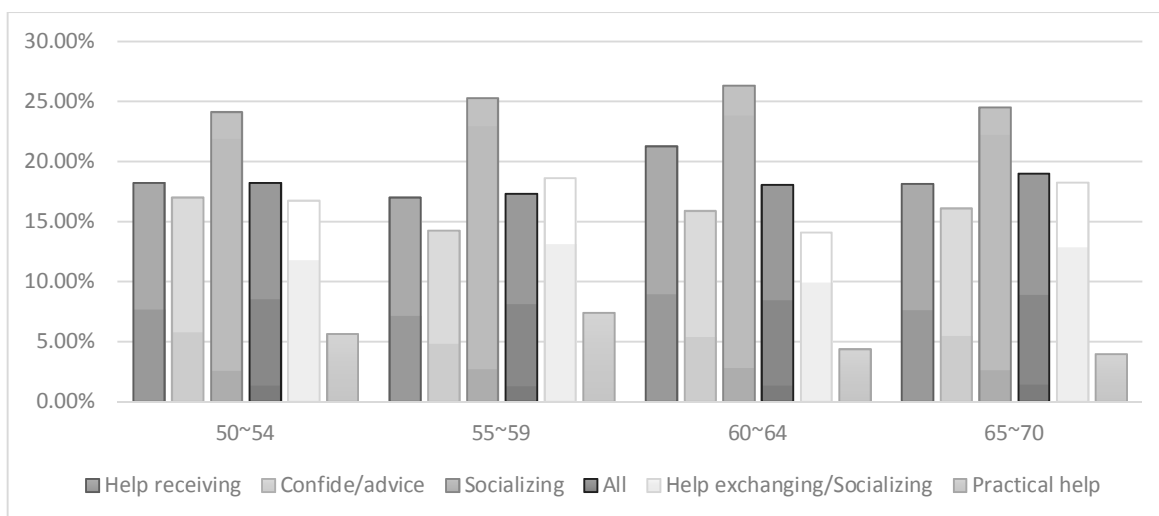


**Figure 4.4** Distribution of social exchange pattern groups among Non-Kin relationships

### Changes in the social exchange patterns of alters with aging

To understand the changing of the alters' social exchange patterns by the ego's aging, I implemented the same MLLC model for the four age groups separately. By comparing results from the different age groups, I tested whether the social exchange patterns of social ties differed in their overall distribution and attributions by aging. Especially, I focused on the association between the role relationship and social exchanging patterns and its changes with aging. The main task of this part is depicting what role relationships sustain or change their activity function as respondents grow old.

Table C.6 and Figure 4.5 show the distribution of six social exchange pattern groups and their characteristics across four age groups (50–54, 55–59, 60–64, and 65–70 years old). Although there were moderate differences, the proportions of social exchange pattern groups did not dramatically changed across the age groups. Especially, the proportions of the “Multiple Involvement,” “Counseling,” and “Socializing” groups were relatively stable across the age groups, whereas other groups showed moderate fluctuations. In the age group of 60–64 years, the proportion of “Help Receiving” was higher than that in any other age group, at 21.26%, while the “Help Exchange and Socializing” group showed the lowest percentage (14.10%). However, the proportions of these two groups regressed on a similar level with the younger groups for the 65–70 years old group. In the case of the “Practical Help” group, the proportion rose to 7.43% from 5.63% in the late 50s and then decreased to 3.97% at late 60s.



**Figure 4.5** Distribution of Six social exchange pattern groups by age groups

The stability of the six social exchange groups across the age groups may imply that old adults were looking for socializing, discussing personal issues and advising, and exchanging help with others as much as they did before, and they generally fulfilled their needs by finding someone from their personal networks.<sup>4</sup> However, the consistency of social exchange groups

<sup>4</sup> Additional analysis (not reported here) also showed that the average frequency of eating together with friends or relatives, going out for a meal, or leisure activities was not significantly different across the four age groups and ranged between “at least once a week” to “at least once a month.” Further, the distribution of respondents who never

does not necessarily mean the partners for those activities are also constant. Aging leads to a certain amount of changes in individuals' life circumstances, social relationships, and personal conditions. Moreover, it resulted in the change of opportunity structure for finding possible associates for each activity. Thus, if possible, an old adult will tend to call the same person for a specific activity that he or she usually did together with that person. Otherwise, he or she may attempt to find a new person from the pool of social contacts or even outside the social network to meet their social needs. In the next section, I examined who generally performed each "activity involvement pattern" and how this differed by age.

### **Changing of the social exchange patterns of role relationships by age**

Table C.7 shows the distribution of six social exchange patterns within each role relationship by the four age groups. Figures 4.6 and 4.7 illustrate the trends of joint probabilities between role relationships and social exchange patterns across the four age groups. Both in kin and non-kin role relationships, some relationships kept their activity involvements constant, whereas others seemed to be changed across four age groups. Among kin relationships, "Spouse/Romantic Partner," "Sibling" and "Other Relative" were relatively stable in their social exchange patterns, whereas the social exchange patterns of "Parent" and "Child" were altered by aging. Notable changes among non-kin relationship were observed in "Workmate," "Organization Mate" and "Neighbor." Meanwhile, "Friend" held the same activity involvement pattern across the four age groups.

#### ***Kin***

*Spouse/Romantic Partner:* Most of the spouses and romantic partners were constantly involved in several activities, with results ranging from 73.54% (age group of 55–59 years) to 64.82% (65–70 years). Whatever the individual's age, old adults were likely to give practical help to, go out for socializing activities with, discuss their personal matters with, receive advice from, and expect help in an emergency situation from their spouse or partner.

*Parents:* Parents' social exchange patterns became more centered on help exchange interactions. In the early 50s, more than half of parent ties were matched with either the "Counseling" (32.5%) or "Multiple Involvement" group (25%). Moreover, half of parents belonged to "Help Exchange and Socializing" (22%) or "Help Receiving" (20%). The proportion of parents respondents named as their confidant or advisor slightly increased in the late 50s, reaching 34.6%, and declines to about 27.5% during the 60s. Parents who were involved in diverse activities steeply decreased, from 25% during the early 50s to 7.7% in the late 60s. Meanwhile, the percentage of parents assigned to exchanging aid rose up. The proportion of parent whom respondents usually helped increased from 20% to about 30%. The percentage of parents in the "Help Exchange and Socializing" group moderately declined from the age of 55 years to 65 years, but it surged to 31% in the late 60s.

*Children:* In contrast to parents, children seem to become more involved in several activities. In the early 50s, most children belonged to single social exchange or help exchange groups. In the results, 43.1% of children belonged to the "Help Receiving" group, 26% to the "Socializing," and 23% to the "Help Exchange and Socializing" group. In contrast, children were involved in multiple social exchange activities (e.g., "Multiple Involvement" group) in 1.4% of

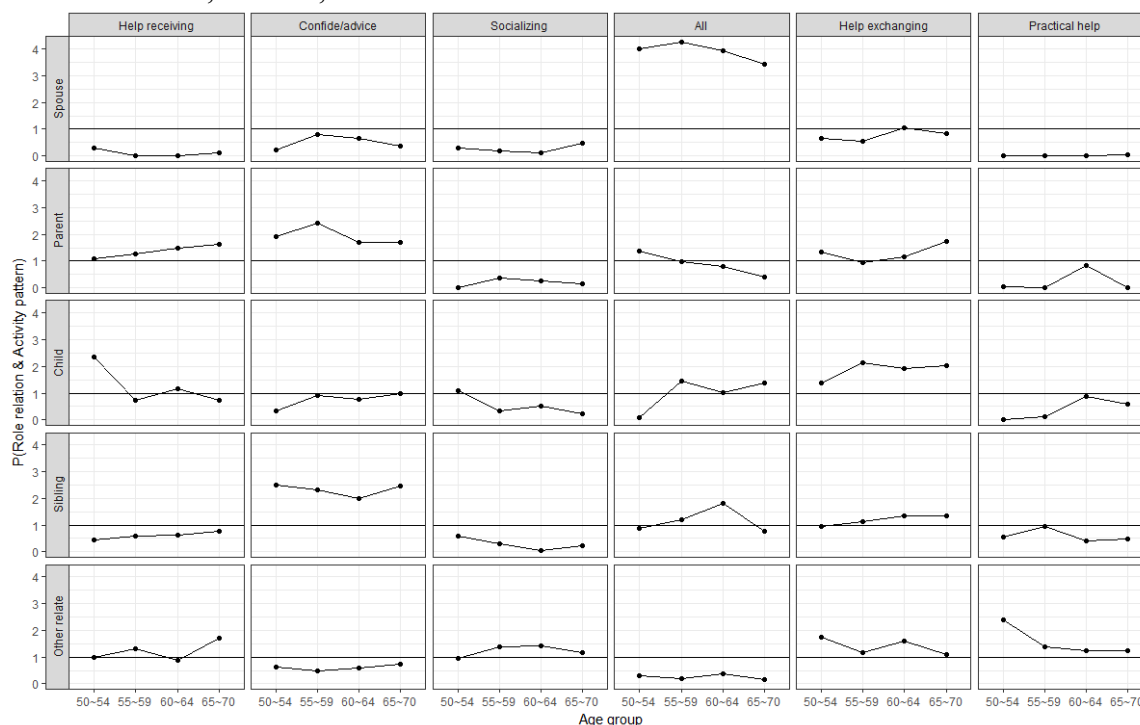
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confided to others or asked for advice or practical help was also constant across age groups (on average, 8.81% of respondent never confided, 9.9% never asked for advice, 28% never received practical help).

cases. The proportion of children in the “Help Receiving” or “Socializing Activity” group steeply decreased to 13.34% and 5%, respectively, in the late 60s. In contrast, the percentages of children belonging to the “Multiple Involvement” or “Help Exchanging and Socializing” group rose to 26.4% and 36.9% for the late 60s. The increasing trend of children’s social exchange patterns was also observed in the “Counseling” group. Only 6% of children were assigned to the “Counseling” group in the early 50s, whereas 15% of children were mentioned as a partner for confiding important matters or seeking advice for respondents in their late 60s.

*Siblings:* Compared with parent or child ties, siblings showed relatively stable social exchange patterns across the age groups. About 40% of siblings in both of the early 50s and the late 60s groups were assigned to the “Counseling” group. Their proportion in the “Help Exchange and Socializing” group inclined from 15.8% to 24.5%. The percentage of siblings involve several activities also increased, from 15.9% to 32.66%, for the early 60s. However, it declined to 14.8% in the oldest age group.

*Other Relatives:* The “Other Relatives” category showed non-monotonic changes in the social exchange patterns. The proportion of other relatives in the “Socializing” group slightly increased from 22.8% to 28.1%, and one in the “Help Exchange and Socializing” group slightly decreased from 29.1% to 20.1%. One notable change of other relatives was that the proportion of the “Help Receiving” group among other relatives surged up to 31.1% in the late 60s, from 18.1% in the early 50s. This multidirectional change of other relatives’ social exchange patterns, to some degree, can be attributed to the broad definition of the “Other Relatives” category. In this survey, the term covered various kin relationships, from in-law relations to grandchildren and ex-relationships. The increasing proportion of “Help Receiving” group among other relatives, for example, may be accounted for by the increasing number of grandchildren, whereas the proportion of socializing activities among other relatives may be mainly derived from adult kin, such as sons in law, cousins, or brothers in law.



**Figure 4.6** Kin: Distribution of exchanging patterns in role relationships by age groups

In sum, among kin relationships, spouses/romantic partners and siblings were likely to maintain their social exchange patterns across age groups, whereas parents and children tended to change their activity participating patterns. In all age groups, spouses and romantic partners were highly likely to engage in multiple activities with the respondents. Moreover, siblings kept their roles as confidants/advisors across the four age groups. The most notable change in the social exchange patterns occurred in relation to parents and children. The parents who used to be involved in many activities, including counseling activity and socializing, were likely to become persons with whom the respondent exchanged aid; meanwhile, children became involved in more activities with aging.

### **Non-kin.**

*Friends:* Across the four age groups, many ties labeled as “Friends” were constantly assigned to the “Socializing” group. About 35–37% of friends were likely to be mentioned only in socializing activities across the four age groups. Compared with other non-kin ties, friends were likely to play a constant function as a partner for socializing activities.

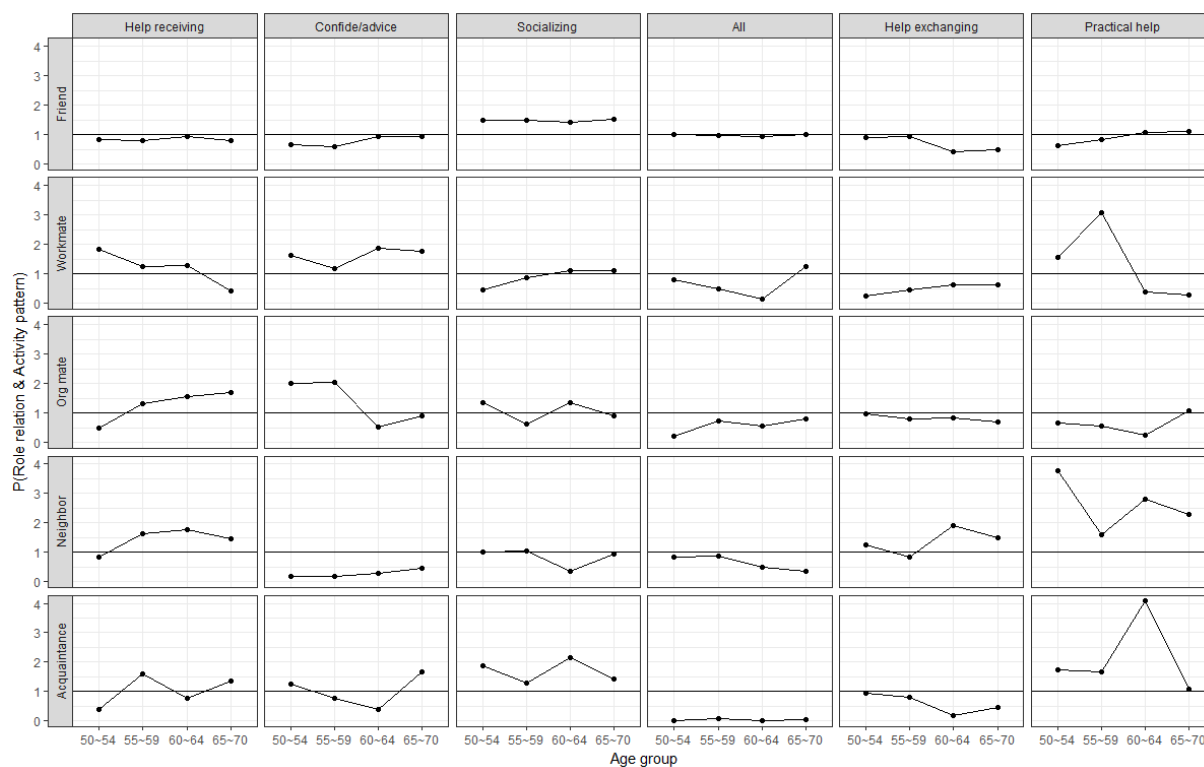
*Workmates:* In our data, the overall proportion of workmates declined from 11.2% in the respondents in the early 50s group to 5% in the late 60s. While work-related ties are likely to be weakened by aging, especially due to retirement events, the social exchange patterns of workmates in my results indicate that remaining workmates tend to strengthen their activity function with age. In the early 50s, 33.4% of workmates were named as persons whom the respondents gave aid to, while 27.65% of them were confidants or advisors. In the late 50s, workmates’ activity involvements seemed to become more instrumental than they were in early 50s. Specifically, 21.16% were assigned to the “Help Receiving” and 22.96% to the “Practical Help Providing” group. However, the proportion of the “Help Receiving” group among workmates steeply decreased to 8% during the late 60s; meanwhile, those of the “Counseling” and “Socializing” groups increased to 28.7% and 27.4% at 65–70 years old. Interestingly, workmates who were involved in multiple activities peaked in the late 60s, at 23.5%. Increasing proportions of counseling, socializing, or multiple activities among workmates may imply that old adults keep and deepen their relationships with some of their workmates by engaging in diverse social activities together, even after retirement.

*Organization Mates:* Unlike workmates, the overall proportion of organization mates was constant across the age groups, at about 5%. However, the change of their social exchange patterns implied that ties with organization mates become or remain for specialized activities rather than deepening by involving them in multiple activities. In the early 50s, more than one-third of organization mates were assigned into the “Counseling” group, and 32.6% were likely to be named for socializing activities. In the late 60s, however, only 14.3% of them maintained their function as confidants or advisors, and 22.5% were assigned to the “Socializing” group; meanwhile, the proportion in the “Help Receiving” increased from 0.9% to 30.9%. Previous studies have reported that the frequency of religious attendance and volunteering increases with aging (Cornwell, Laumann, and Schumm 2009). Old adults may more frequently interact with their organization mates under institutional contexts like religious services than young adults do. However, the results in this study may imply that the social relationship with organization mates are less likely to be developed by expanding activity involvements.

*Neighbors:* Although the proportion of neighbors in this data was relatively small and constant across the age groups (from 7.86% at 50–55 years old to 9.11% at 65–70 years old), the

relationship with neighbors is likely to become a bit more reciprocal in providing and receiving practical help with aging. During the early 50s, individuals were likely to mention their neighbors as persons from whom they receive practical help (21% of neighbors were in the “Providing Practical Help” group), but this proportion decreased to 9% in the late 60s. Meanwhile, the proportion of neighbors in the “Help Receiving” and “Help Exchange and Socializing” groups moderately increased from 15.2% to 26.5% and 20.8% to 27.51%, respectively. This may imply that older adults come to take more care of their neighbors than relatively younger adults do, providing aid and expecting potential help from them.

*Acquaintances:* “Acquaintances” represented the smallest role relationship in these data. About 3% of alters were given this label. Many acquaintances across all age groups are assigned in the “Socializing” group, varying from 56% to 32%. One interesting point is that a substantial percentage of acquaintances for respondents between the ages of 55 and 64 years old were named as persons whom the respondents received practical help from.



**Figure 4.7** Non Kin: Distribution of exchanging patterns in role relationships by age groups

To summarize the results, friends, representing more than 35% of the overall network members in each age group, were likely to maintain their activity involvement pattern as socializing partners. Neighbors also tended to constantly call for exchanging practical help, while this relationship seemed to become more reciprocal in the late age groups. Meanwhile, relationships with workmates became deeper with expanding activity involvement, although this only seemed to hold for those who remained in personal networks after retirement. In contrast, organization mates were likely to represent a more instrumental relationship and lose their function as confidants or advisors with aging.

## Conclusion

The change in social relationships of old adults is a key element to understanding the old population's social integration. Previous studies on this issue have reported extensively that the shape and characteristics of the social network of the old population are significantly different from those of the young population, and the changing pattern with the aging process is complicated (Marsden 1987; Morgan 1988; Bosse et al. 1993; Krause 1999; Shaw et al. 2007; Cornwell, Laumann, and Schumm 2009). To comprehensively understand the association between the change of personal networks and aging, this study suggested the following questions: Whom do old adults spend their time together, what activities do they pursue, and how does this change with aging? Using rich personal network survey data and MLLC models, this study elucidated distinctive social exchange patterns of network members and demonstrated how social role relationships' activity involvement patterns change across different age groups.

From MLLC models, six different social exchange patterns were detected. One group of alters tended to interact with the ego through multiple activities, ranging from exchanging practical help to confiding, advising, and socializing together. Other groups of alters seemed to serve for a certain activity, such as socializing, confiding/advising, or providing or receiving social aid. Each group of alters differed from the other groups, not only their social exchange patterns but also in the attributes of the relationship. Alters who were involved in multiple activities were likely to be emotionally and geographically close with the egos, whereas alters specialized for help exchange or socializing tended to be less close emotionally but live proximally to the ego. Alters in whom the ego confided or sought advice from were likely to be emotionally bonded with the ego, but they did not necessarily live close by.

The findings confirm that people selectively choose their network members according to what they need or want. Moreover, many alters in social networks serve for single social changes (Fischer 1982; Wellman Wortley 1990). The complex personal network configuration of social ties based on social exchange patterns may be derived from a set of individuals' intentional or unintentional choices about whom they can engage in a given activity with under the structural opportunity and constraints, as well as certain relational contexts and individual preferences or personality. For instance, when individuals need some instrumental help, such as car rides or moving furniture, they cannot rely on those who live far from them, even if these people are the first option they think about. Under this constraint, they seek other network members who are geographically accessible and can offer the needed help, even if the selected alter is not emotionally close to the ego. In contrast, as long as an individual think that a person who can provide counseling knows about his/her current situation and is accessible in the moment, the individual may rely on that person even if he or she lives far away, using diverse communication mediums like the telephone, text messaging, or online connection.

Stable distribution of the six exchange patterns across age groups is one of the interesting and insightful findings in this study. The oldest age group (65–70 years old), for example, exhibited a similar proportion of alters for multiple activities, socializing, counseling, and providing help to the youngest age group (50–54 years old). Given that age is complexly associated with network attributes, such as size, the volume of contacts, and the composition of kin and non-kin members, the relatively stable distribution of social exchange patterns across different age group implies that people's social needs do not necessarily become narrower with age. Rather, old people exchange as many social services with their network members as they

used to do. Moreover, under the given constraints related to the aging process, to some degree, old adults successfully find a person for a certain activity from their social network pool. What people do with their network members, in general, does not dramatically change with aging.

Despite the previous finding, the results of this study showed significant variances in the alters with whom individuals spend time with increased age. The differences across the age groups in the social exchange patterns of social role relationships informs us that the social exchange patterns of some social relationship change with aging. Some of the social role relationships maintain their social exchange patterns, whereas others are altered. For example, old adults constantly interact with their spouses, engaging in multiple activities, as they did before. Children who used to be help receiver are likely to become more reliable partners in help exchanging, counseling, or more activities. Parents who used to be involved in several activities tend to become persons whom the ego should care for. To some degree, the age-related changes of kin relationships in the social network can be understood as a gradual replacement of the older generation's social exchange functions by the same or younger generations. Yet, spouses keep their strong exchange function in the later life stages as long as they are together. Among non-kin ties, friends and neighbors show relatively stable social exchange patterns as partners for socializing activity for friends and exchanging aid for neighbors. Unlike kin ties, which are almost given relationships, individuals can make new friends and new neighbors. At the same time, they can move away from old friends and old neighbors. Therefore, the consistency of friends' and neighbors' activity involvement does not necessarily imply that individuals preserve their relationships with old friends or neighbors. Rather, this can be understood as individuals' inclination or habitual tendency about what they do with a person labeled as a "friend" or "neighbor." Whether keeping relationship with old friends and neighbors or making new friends and neighbors, old adults preserve their way of interacting with people they call "friends" or "neighbors." In case of workmates, while a smaller number of workmates remained in personal networks in the oldest age group than the relatively younger ones, the remaining workmates tended to deepen their relationships with the egos by exchanging advice and discussing personal matters. In contrast, organization mates came to have a more instrumental relationship and became less involved in the confiding and advising context. The changing of social exchanging patterns of workmates and organization mates shows an interesting contrast. In terms of the institutional context, retirees develop their relationships with the remaining former coworkers through non-work-related social exchanges, whereas organizational mates, who are supposed to belong to an ongoing institutional context, become less involved outside that institutional context. One possible explanation about the developing relationship with former coworkers after retirement is that workmates remaining in personal networks are likely to share similar contexts of life after retirement and aging (Atchely 1971). Thus, old adults may be more likely to choose their workmate as a partner for discussing personal matters and exchanging advice. In the case of organizational mates, the given institutional context in which they are involved together may induce some obligation to help each other, whereas life experiences outside the organizational context are less synchronized with each other than those with remaining workmates. Thus, individuals may interact with their organization members with a view to exchanging aid outside the institutional context.

The overall findings from this study suggest that flexible preserving or altering of individuals with whom the ego can engage in activities, and what those activities are, is one of the key processes of old adults' adaptation to new life conditions. This, in turn, contributes to



maintaining old adults' social integration under the given age-related changes and their constraints.

As final remarks, I should note the limitations of this study, which can serve as an important starting point for future research. First, I used six different social exchange variables to identify the patterns of social exchanges of alters. While these measurements attempt to cover diverse contexts of social exchange activities, from socializing to support exchange, it will be possible to expand the range by adding other activities, such as exchanging economic aids. In addition, some future research can develop social exchange patterns by focusing on a specific context, such as support exchanging and measuring several supportive activities separately. Second, this study mainly focused on the alter-level attributes in describing differences of activity involvement patterns. In a future study, it will be an important task to examine the variances between individuals. For example, gender, socioeconomic status, residential condition, or race and ethnicity will be associated with the individual's network adjustment process. Furthermore, some future studies can pay attention to the variances within the social role relationship. As shown in my analysis, activity involvement patterns are varied not only between role relationships but also within a specific role relationship. For example, while more than one-third of friends were mentioned only for socializing activities by the respondents, 18.45% of alters named as friends were listed in several activities, including socializing activities. This may imply that there are meaningful variances between individuals in labeling or describing their specific relationship, especially in terms of non-kin relationships. Third, while this study showed age differences in the social exchange patterns of the alters, the age-related changing of social support can be studied in a more direct fashion using a longitudinal design, which will allow describing and testing the change of individual ties' activity functions across a given time span. With all these limitations and potentials for future research, the results of this study put forward substantial evidence for understanding the social network adjustment of old adults as one way of maintaining social integration.

## Chapter 5

### Conclusion: A Tie-centered Approach.

The core question of all three papers is how to define and interpret the practical meanings of a dyadic social relationship. Related to this question, one of the contributions of ego-centric social network studies is that they have provided diverse ways of defining social relationships based on “actual” relationship data. Instead of employing socially shared expectations of social relationships, ego-centric network researchers have described social relationships by directly drawing upon respondents’ accounts on multiple aspects of their social relationships, such as intimacy, transaction activities, frequency of interaction, geographic reachability, or length of a relationship. Many network scholars have developed diverse network survey items for capturing characteristics of social relationships, such as Fischer’s name-generating and interpreting questionnaires (Fischer 1982). They have also conceptualized observed characteristics of social relationships under the guidance of theories related to specific research interests, such as social capital, social exchange, or social support theory. For example, when the intimacy level of social relationships is the main interest of study, ego-centric network studies directly ask respondents to rate how close they feel to their network members instead of assuming that some of the social ties of respondents would be intimate relationships (e.g., between romantic partners, best friends, or parent and child).

However, despite that the ego-centric network survey collects actual relationship information, the general image of social ties still remains to the dominant assumption for interpreting the meaning of social relationships in many empirical ego-centric network studies. In a practical study situation, most ego-centric researchers would operationally define observed social ties by selecting one or a few tie-level attributes based on their study interests and related theories. For instance, again, when the intimacy of social relationships is an area of interest, the researcher would quantify observed social ties, from a non-intimate relationship to a very intimate relationship, by using respondents’ ratings of closeness for each of their social relationships. Then, the studies would interpret the differences between intimate ties and non-intimate ties based on the general image of social relationships characterized by emotional closeness that is often associated with intensive interactions, self-disclosure, or physical closeness. Although this kind of interpretation of the meaning of social ties may be able to be justified by sound theories or concepts, such as Granovetter’s strength of social ties (Granovetter 1972), this rough abstraction of social relationships ignores the varying meanings of relational attributes across individuals and across social ties.

To make this point clear, let’s keep thinking about emotional closeness. When we quantify a dyadic relationship based on whether a certain social relationship is intimate (1) or not (0), we would say that the emotionally close ties have a different meaning from ties that are not emotionally close. However, does it mean that all emotionally close ties are the same social

relationship? Can the emotional attachment to a spouse be treated as having equal emotional closeness to best friends? In other words, is the meaning of a relationship with a spouse identical to the meaning of a relationship with a close friend merely because both relationships are equally emotionally close? If we cannot say that emotional closeness does not indicate the same meaning of social relationship in personal networks, how can we say that a person with five intimate ties is different from others with three emotionally close social relationships, as a person who has \$5 is different from a person who has \$3? Let's suppose that a researcher finds that having five emotionally close relationships is better than having two intimate relationships in keeping cognitive mental function. A reasonable interpretation of this positive association between the number of close ties and cognitive function may be derived from the assumption that emotional closeness is, in general, a positive thing, such as how \$5 is better than \$3. But, what if there is a person who feels the same level of intimate with four female friends as he feels with his wife? Can we still say that this guy's cognitive function is good because feeling intimacy is generally a positive virtue of a relationship? A more realistic explanation may be that this person has to maintain his cognitive function in order to handle emotional tensions raised from these four intimate relationships. The point that I want to make here is that the meaning of a certain relational characteristic emerges from the interaction between two persons. Accordingly, the practical meaning of a social relationship captured by an observed variable cannot be solely inferred from the generalized substantive meaning of variable attributes.

Then, how can we figure out a particular meaning of social relationships with ego-centric network survey data? All three empirical studies in this dissertation are the results of my effort to answer this question. In my conclusion, I would like to suggest an alternative approach to study social networks with ego-centric network data, which I call the tie-centered approach. The tie-centered approach is grounded on two schools of sociological theories related to dyadic social relationships and the cultural meaning of social entities. And methodologically, this approach suggests using clustering methods that are well fitted with the relational nature of social entities.

For a long time, social ethnographers, social psychologists, symbolic interactionists, and cultural sociologists have been required to treat the dyadic social relationship as a unique social entity that has its own subjective meaning (Mitchel 1967; McCall 1970; McLean 1998; Fine and Kleinman 1983; White 1992; Emirbayer and Goodwin 1994; Fushe 2009). Even though each theoretical strand has tackled the subjective meaning of social relationships in a different way, the shared underpinning is that the social relationship is an intersubjective entity which emerges, adjusts, and changes through repeated interaction between two persons. Through interaction, interactants have developed a relatively stable shared understanding of the subjective and objective situations of their interaction. Based upon the shared understanding of particular interaction contexts, individuals construe their interaction partners' behaviors and cues and act and react in response to their counter partner's expectations. The intersubjective consensus on "what is going on" in a particular relationship (Goffman 1974) becomes primary constraints on particular interactions (McLean 1998). The ways of interpreting the subjective and objective context of a given social relationship are shaped neither by the social norms of relationships nor by an individual's predispositions. Rather, they depend on two individuals' intersubjective understanding of their social relationship. Thus, dyadic social relationships should be seen as a culturally constituted process of two individuals' interaction (Mische 2003) and "phenomenological reality" (White 2008) of interactants.

In regard to the ego-centric network survey, the intersubjective nature of the interpersonal relationship has two important implications. First, the meaning of social relationships dwells

neither in the ego nor the alter. Rather, particular social relationships gain their meaning for each interactant through the intersubjective process of interaction between two persons. In this sense, the social tie is a social entity that emerges and exists between two persons. Accordingly, the diverse characteristics of social ties that we observed from ego-centric network data are not information that reflects individuals' psychological predispositions or the general cultural norm that is borne upon individuals. Although there may be a coherent pattern that penetrates through all social ties within one person's social network, it does not mean that every intersubjective context of social ties is identical to each other merely because these ties belong to one person. In the same sense, social ties are not a mere building block of social networks. While the social network is more than the sum of social ties, and the network itself is one of the important factors that influence each social tie's interaction process, dyadic social ties have their own intersubjective context that is not fully explained by the overall network system and context. Therefore, when we study social networks and their association with the social behaviors of individuals, the social tie itself should be seen as a central unit of analysis as much as the person and network have been treated.

The second implication is that a observed attribute of the social relationship in the ego-centric network data contains varying meanings according to the intersubjective context with a particular alter. Objective and subjective contexts and contents of a social relationship gain their own meaning from the intersubjective consensus between two people. Accordingly, even if one respondent describes some of his or her social relationships with the same value of relationship attribute, it does not mean that this relationship attribute implies the same meaning across all of those social relationships. For example, when respondents describe the relationships with two of their network members (let's say A and B) as emotionally close, the emotional closeness that respondents feel with person A may not be equal with person B. When I say, "I love my mother," that feeling of love toward my mother is not equivalent to the feeling of love toward my wife. As long as my relationship process with my mother is different from that with my wife, what I meant by "love" in the relationship with my mother indicates a different quality of feeling from that in my relationship with my wife. When the feeling of love is an emergent product from the intersubjective interaction process between me and a particular person, the feeling of love cannot be comprehensively interpreted by the general meaning of love or by my personal belief about love. Not only do the subjective attributes of social relationships have different meanings, but the objective characteristics of social relationships also has different meanings according to the intersubjective context of a particular relationship. For example, geographical proximity apparently is one of the physical conditions of social relationships. When someone in a personal network lives far away from the ego, it might be hard for the ego to frequently interact with this person and exchange practical aid with the person. However, the meaning of geographical separation for the ego has a different meaning according to who the distant persons are. When the ego has best friends who live far away, the meaning of geographical separation with that friend would have a different implication for that ego compared with the meaning of geographical separation with his or her co-workers who also live far away. Also, what this ego can do with long distant network members differs not only because of the physical distance but also due to the intersubjective understanding between two persons on what transactions are allowed or not. The meaning of objective conditions of social relationships is also derived from the intersubjective context between two persons.

When dyadic social relationships are a social entity composed of intersubjectively signified characteristics, how can we assess these varying meanings of social relationships with the given

manifest descriptions we obtained from the ego-centric survey? I attempt to answer this question by drawing on the relational perspective. As Mustafa Emirbayer well laid out (Emirbayer 1997), the core idea of relationalism is that a set of relationships with other entities defines the meaning of entities (or “things”) rather than the substance meaning of entities signifying their relationships with other entities. This relational perspective is also a primary tenet of social network perspectives. Instead of assessing the social behaviors of individuals from pre-given norms or their independent rationality, network scholars have characterized an individual actor with that individual’s positionality in social network structure and attempted to explain individuals’ behavioral outcomes by their attributes figured out from their relationships with other actors (Bearman 1983; Emirbayer and Goodwin 1994). For example, the block-modeling technique in network studies starts with defying the substantive meaning of social categories, such as family or friends. Instead, this approach clusters individuals or ties who take a similar position in the overall network structure. Instead of assuming the substantive meaning of a certain relational role, the role of individuals (or ties) gains its practical meaning from its positionality in the network structure (Lorrain and White 1971). According to Emirbayer, this relational perspective also has a clear affinity with cultural studies that argue that particular terms gain their distinctive meanings under the relationship structure with other terms rather than the meaning of a particular term being derived from its substantive properties (Saussure 1959; Lévi-Strauss 1963; cited in Emirbayer 1997).

The implication of relational perspective is that the meaning of a relationship between two persons is not derived from their pre-established norms about the relationship. Rather, their varying meanings are derived from the web of multiple elements involved in the relationship. At the same time, each element of a social dyadic relationship gains practical meaning through its relationship with other elements. For example, when we observe a relationship between a husband and wife, the meaning of this marital relationship is not derived from a general expectation about what such a relationship should be. Rather, the role of the husband and the wife and this relationship are signified through the web of multiple aspects that emerge in this particular relationship. In the same sense, the term “love” used to describe the relationship between a husband and wife is not something that explains the marital relationship with its own substantial meaning. Rather, the term “love” gains its practical meaning through its relationship with other attributes of a relationship between two persons. The dyadic relationship and each element in a social relationship get their distinctive meaning from the web of other relational attributes.

The theories on the intersubjective nature of the social dyadic relationship and the relational perspectives offer many insights into empirical ego-centric network studies. However, in practical research with ego-centric network data, the idea of relationalism and intersubjectiveness of dyadic social relationships have rarely been applied in operationalizing given relationship variables and interpreting study results. Instead, the majority of studies still remains committed on the substantial perspective, which assumes each variable has its own fixed meaning. As Abbott pointed out, empirical research with linear models stands on the assumption that an observed variable presents a fixed entity which causes or is associated with other outcomes, but it is not changed by those associations (Abbott 1988). Many ego-centric network studies have operationally defined social relationships based on this so-called “variable-centered approach.” By selecting a few relationship variables such as emotional closeness, transaction contents, contact frequency, and so on, empirical studies classify social relationships and define individual social networks as an aggregate entity of those chosen variables (e.g., size of intimate

ties, social support network, etc.). And the interpretation of empirical findings on the association between social network attributes and other external variables tends to rely on each selected variable's substantial meaning. As discussed above, when researchers found a significant association between the number of emotionally close ties and a certain outcome variable, the interpretation relied on the fixed and ambiguous meaning of intimacy; intimate ties would be positive quality of social relationships. This way of operationalization of relationship variables and interpretation of study results detaches the meaning of social relationships from their particular intersubjective contexts. Even though social network research develops the relational perspective as defying the pre-assigned meaning of social relationships (what network researchers call "anti-categorical imperative") (Emibayer and Goodwin 1994; Bearman 1997; Wellman 1988) and ego-centric network surveys collect various information of social relationships directly from respondents, many empirical studies using ego-centric network data still remain committed to the substantial perspective of social relationships. Put simply, while network studies no longer depend on the general norms or roles of what particular relationships should be, they still rely on the general expectations of what observed elements of social relationships would be.

The tie-centered approach that I would like to suggest here aims to provide an alternative approach to the ego-centric network studies based on the theories on the intersubjective nature of social relationships and relational perspective. The tie-centered approach at first suggests treating a social dyadic relationship as a unit of analysis instead of seeing it as an individual possession or a mere building block of social networks (this is why I call this approach a "tie-centered approach" in distinction from an "ego-centered" and "network centered" approach). Second, following the theories on the intersubjective nature of social relationships, the tie-centered approach defines a social tie as a social entity that is composed of intersubjectively signified multiple elements. Third, as the relational perspective suggested, the meaning of social relationships is determined neither by pre-established norms about relationships nor by substantial meaning of a few given variables. Rather, the different meanings of social relationships are derived from a configurational pattern of multiple elements (this is another reason for naming this method the "tie-centered approach" in distinction from the "norm-based" and "variable-centered" approach). In the same sense, the practical meaning of each element of social relationships can be inferred from the interdependent relationships with other elements.

Methodologically, the tie-centered approach can be implemented by using several statistical models that can capture the configurational structure of multiple characteristics of social relationships. As shown in my three empirical studies in this dissertation, the multi-level latent class model can serve to identify groups of social ties that share a similar configurational patterns among multiple characteristics. Alternatively, multiple corresponding analysis or a Galois lattice analysis may be applied to the respect that these methods can serve to figure out co-constitution structure among multiple dimensions (Bearman and Parigi 2004; Breiger 2000). A Relational Class Analysis (Goldberg 2011) or Belief Network Analysis (Boutyline and Vaisey 2017) also can be applied to study the complex relationships among multiple relationship attributes. These statistical models may not only cluster social ties but may also be able to show the relational structure of multiple components of social relationships.

The tie-centered approach suggested in this dissertation provides implications for a number of possible future research agendas using ego-centric network data. As an extension from my findings from the three empirical studies, one possible direction for research is to trace the change of social relationships over time. The intersubjective and relational nature of social ties

suggests that a dyadic relationship is a dynamic entity in the sense that its multiple attributes gain and regain new meaning by changes in other elements. Therefore, changes in life context of the ego or alter (or both of them) may jointly induce changes in a couple of tie-level attributes. And other relationship elements will be adjusted in varying degree along with this change, which, in turn, result in altering the meaning of social relationships. Another possible application of the tie-centered approach is to conduct the international comparative study of social relationships and networks. One of the practical challenges of comparison studies between different societies in personal network research is determining how to confirm the comparability of survey items. Each society or cultural milieu may have its own cultural meaning of intimacy, friends, and so forth. If the meaning of intimacy in the United States is different from the term *intimité* in French, for example, how can we confirm that researchers gather a comparable concept from the two countries? This challenge is derived from the adherence to the substantial perspective, which assumes that intimacy or *intimité* contains its own substantial meaning in each society. The tie-centered approach, in contrast, rejects the ontological meaning of each term and suggests deriving the practical meaning of each element in a relationship from its relationship with other tie-level attributes. In this perspective, the question is not whether given survey items are similar or different between societies. The matter is how the configurational patterns of multiple attributes of social relationships are different or similar between societies. By figuring out the differences or similarity of configuration structures of relationship attributes, research can find the varying meaning of social relationships, such as friendship, love, or confidants, across different societies.

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## Appendix A

### Appendix to Chapter 2: Different discussion partners and their effect on depression

**Table A.10** Descriptive Statistics

Level	Variable	Values	Mean(SD) or %
Tie-level N=2,557	Emotional closeness	Not especially close	31.63
		Especially close	68.37
	Geographical proximity	Live more than one-hour driving distance	24.76
		Live within one-hour driving distance	75.24
	Socializing	Not socializing together	42.08
		Socializing together	57.92
	Emergency help	Does not expect help in emergencies	58.55
		Expects help in emergencies	41.45
	Practical help	Not receiving practical help	81.85
		Receiving practical help	18.15
	Providing help	Not providing help	54.33
		Providing help	45.67
	Relationship	Family	30.73
		Extended family	18.29
		Friend	30.81
	Age homophily	Others	20.17
		Different age	49.12
		Same age	50.88
	Gender homophily	Different gender	35.93
		Same gender	64.07
Racial homophily	Different race/ethnicity	24.83	
	Same race/ethnicity	75.17	
Relationship tenure	Known for more than one year	96.29	
	Met last year	3.71	

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Gender	Male	45.08
	Female	54.92
Marital status	Spouse/partner	76.71
	Widowed/divorced/separated	15.20
	Never	8.09
Race/ethnicity	White	60.81
	Asian	17.71
	Latino	14.00
	Black/other	7.48
Education	Lower than a bachelor's degree	52.65
	Bachelor's degree	25.54
	Higher than a bachelor's degree	21.80
Employment status	Unemployed	26.12
	Retired	40.68
	Full-time employment	33.20
Personal level Household income N=448	Less than 35k	15.75
	2.35k~75k	23.45
	More than 75k	60.80
U.S. born	Yes	80.14
	No	19.86
Survey mode	Face-to-face	78.51
	Web	21.49
Age		59.32 (5.80)
Number of discussion partners		5.15 (2.53)
Network size		14.24 (6.13)
Proportion of kin		0.41 (0.22)
Sociable personality		2.20 (1.04)
Years in current town		24.14 (15.40)
Number of negative events		0.84 (0.87)
General health status		2.47 (1.09)
Depression index in wave 1		12.22 (4.05)
Depression index in wave 2		12.22 (4.45)
Loneliness in wave 1		1.76 (3.19)
Loneliness in wave 2		2.08 (3.42)

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**Table A. 11** Goodness-of-fit Statistics for Multi-level Latent Class Models

Models	N of classes		LL	BIC (LL)	AIC (LL)	BIC (LL, Ng)	Npar	Class. Err
	Tie level	Person Level						
M 1	1 class		-9580.23	19207.54	19172.47		6	0.00
M 2	2 classes		-8930.51	17963.01	17887.01		13	0.11
M 3	3 classes		-8837.18	17831.29	17714.36		20	0.12
M 4	4 classes		-8793.99	17799.83	17641.99		27	0.24
M 5	5 classes		-8782.55	17831.88	17633.10		34	0.25
M 6	4 classes	R.C. <sup>a</sup>	-8714.25	17663.89	17488.50	17619.65	30	0.20
M 7	4 classes	2 clusters	-8689.95	17646.67	17447.90	17596.54	34	0.17
M 8	4 classes	3 clusters	-8682.75	17663.66	17441.51	17607.63	38	0.17

Notes: <sup>a</sup> R.C.: Random coefficient.

**Table A.3** Tie-level Latent Class Profile: Conditional Probabilities

	Strong tie type	Companion type	Remote type	Acquaintance Type
Cluster size	37.22%	19.11%	19.68%	24.00%
Emotionally close	0.78	0.99	0.82	0.24
Live nearby	0.87	0.99	0.01	0.87
Socializing	0.90	0.66	0.17	0.37
Emergency help	0.78	0.42	0.12	0.11
Receiving practical help	0.40	0.10	0.05	0.07
Providing Help	0.78	0.33	0.31	0.15

**Table A.4** Tie-Level profile with covariates

		Strong tie type	Companion type	Remote type	Acquaintance type	Wald	p
Relationship	Family	0.49	0.43	0.22	0.18	1318.66	0.00
	Extended Family	0.12	0.13	0.33	0.16		
	Friends	0.28	0.28	0.31	0.31		
	Others	0.11	0.16	0.14	0.34		
Same age		0.57	0.53	0.54	0.45	27.6597	0.00
Same sex		0.60	0.56	0.74	0.67	23.5195	0.00
Same race		0.76	0.72	0.79	0.68	3.1431	0.37
Newly known		0.01	0.04	0.01	0.05	7.5512	0.05

**Table A.5** Tie-level Latent Class Profile: Young

Pro-mean	Strong tie type	Companion type	Remote type	Acquaintance Type
Cluster size	37.22%	19.11%	19.68%	24.00%
Emotionally close	0.42	0.26	0.23	0.09
Live nearby	0.45	0.25	0.00	0.30
Socializing	0.58	0.21	0.06	0.16
Emergency help	0.69	0.18	0.06	0.06
Receiving practical help	0.76	0.09	0.06	0.09
Providing help	0.64	0.14	0.14	0.08

**Table A.6** Tie-Level Latent Class Profile: Old

		Strong tie type	Companionship type	Remote type	Acquaintance type	Wald	p-value
Relationship	Family	0.47	0.32	0.11	0.11	1318.66	0.00
	Extended family	0.24	0.20	0.35	0.20		
	Friends	0.33	0.26	0.19	0.22		
	Others	0.21	0.24	0.14	0.41		
Same age		0.37	0.27	0.18	0.18	27.6597	0.00
Same sex		0.33	0.24	0.21	0.22	23.5195	0.00
Same race		0.36	0.26	0.19	0.19	3.1431	0.37
Newly known		0.14	0.39	0.06	0.42	7.5512	0.05

**Table A.7** Person-Level Latent Cluster profile

	Mixed type	Divided type
Size	42.0%	58.0%
Strong tie type	24.2%	44.9%
Companionship type	34.4%	4.2%
Remote type	32.9%	7.5%
Acquaintance type	9.2%	38.4%

**Table A.8** Person-Level Latent Cluster Profile with Covariates

		Divided type	Mixed type	Wald	p- value
	Overall	58.02	41.99		
Age	Mean	59.26	59.25	0.20	0.66
Gender	Male	0.52	0.48	1.57	0.21
	Female	0.60	0.40		
Marital status	Has spouse/partner	0.57	0.43	0.31	0.86
	Widowed/divorced/separated	0.56	0.44		
	Never married	0.46	0.54		
Race/ethnicity	White	0.50	0.50	9.07	0.03
	Asian	0.62	0.38		
	Latino	0.69	0.31		
	Black/other	0.54	0.46		
Employment Status	Unemployed	0.58	0.42	1.53	0.47
	Retired	0.60	0.40		
	Fully employed	0.51	0.49		
Education	Lower than a bachelor's degree	0.55	0.45	1.76	0.42
	Bachelor's degree	0.60	0.40		
	Higher than a bachelor's degree	0.56	0.44		
Household income	Less than 35k	0.55	0.45	0.55	0.76
	35k~75k	0.60	0.40		
	More than 75k	0.55	0.45		
U.S. Born	Yes	0.56	0.44	0.59	0.44
	No	0.57	0.43		

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Table A.8-continued from previous page

Number of discussion partners	Mean	5.15	5.03	5.98	0.02
Network size	Mean	14.15	14.05	0.74	0.39
Proportion of kin	Mean	0.41	0.40	10.6 3	0.00
Sociable personality	Mean	2.20	2.19	3.52	0.06
Years in the current town	Mean	24.27	23.70	4.57	0.03
General health status	Mean	2.49	2.44	4.87	0.03
Number of negative events	Mean	0.84	0.83	0.03	0.86
Survey mode	Face-to-face	0.56	0.44	0.53	0.47
	Web	0.58	0.42		

**Table A.9** Regression Estimates Predicting Depression at Wave 2

	Model 1		Model 2	
	Coef	S.E	Coef	S.E
Depression in Wave 1	0.722***	0.053	0.491***	0.068
Mixed type				
Divided type	0.847**	0.296	-3.389**	1.104
Depression in wave 1 X mixed type				
Depression in wave 1 X divided type			0.369***	0.099
Number of discussion partners	0.192**	0.065	0.175**	0.064
Network size	-0.073*	0.030	-0.069*	0.029
Proportion of kin	-0.719	0.720	-0.455	0.709
Age	0.008	0.031	0.005	0.031
Male				
Female	-0.256	0.274	-0.281	0.264
Has a spouse or partner				
Widowed/divorced/separated	-0.227	0.505	-0.058	0.481
Never married	-0.703	0.557	-0.572	0.534

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White				
Asian	-0.046	0.403	0.133	0.412
Latin	0.901*	0.456	0.718	0.437
Black/other	0.291	0.634	0.205	0.621
Lower than a bachelor's degree				
Bachelor's degree	0.002	0.344	0.011	0.329
Higher than a bachelor's degree	0.345	0.370	0.447	0.361
Unemployed				
Retired	-0.645	0.379	-0.731*	0.367
Full-time employed	-0.227	0.359	-0.361	0.348
Less than 35k				
2.35k~75k	-2.227***	0.556	-1.942***	0.526
More than 75k	-2.070***	0.574	-1.741***	0.521
Sociable personality	-0.148	0.147	-0.172	0.140
Number of negative events	-0.028	0.156	0.020	0.151
Years in the current town	-0.001	0.009	-0.008	0.009
U.S. born	0.353*	0.151	0.399**	0.145
Born outside the U.S.				
General health	0.125	0.357	-0.131	0.358
Face-to-face				
Web	0.739*	0.3422	0.896**	0.336
Constant	4.267**	2.342	6.850**	2.2896

\* p-value<0.05, \*\* p-value<0.01, \*\*\* p-value<0.001

## Appendix B

### Appendix to Chapter 3: Multiple types of friends and life course

**Table B.1** Descriptive Statistics

			Young Age group		Old Age group	
			Freq.	Percent	Freq.	Percent
Ego level	Gender	Male	117	30.43	185	35.26
		Female	266	69.57	340	64.74
	Marital Status	Married	43	11.11	344	65.56
		Partner	251	65.46	117	22.35
		Single	90	23.43	63	12.09
	Race/Ethnicity	White	187	48.79	394	75
		Asian	110	28.74	49	9.27
		Latino	64	16.67	37	7.12
		Black/Others	22	5.8	45	8.61
	Education	Less than Bachelor	83	21.55	146	27.83
		Bachelor	209	54.48	183	34.83
		More than Bachelor	92	23.97	196	37.33
Employment status		Unemployed	76	19.81	149	28.31
		Student (Retiree for old	123	32.13	212	40.4
		Employed	184	48.07	164	31.29
Household Income		Less than 35k	185	48.29	93	17.62
		35k–75k	106	27.56	145	27.68
		More than 75k	92	24.15	287	54.7
Sociable personality		Out going	213	55.66	369	70.36
		In between	94	24.58	93	17.72
		Introvert	76	19.76	63	11.92
Survey Method		Face to Face	109	28.5	397	75.66
		Self-administrative	274	71.5	128	24.34
Recruit method (only		Letter recruited	155	40.34		
		Facebook recruited	228	59.66		
Age			25.64	2.73	60.88	5.89
Residential tenure in the current town			4.52	6.77	24.08	15.20
Network Size			12.39	4.02	11.75	4.25
Network Density			0.42	0.50	0.46	0.49

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Table B.1-Continued from previous page

Tie level	Homophily	Different Age	144	15.47	629	44.74
		Same Age	787	84.53	777	55.26
		Different Gender	253	27.18	321	22.83
		Same Gender	678	72.82	1,085	77.17
		Different Race/Ethnicity	429	46.08	382	27.17
		Same Race/Ethnicity	502	53.92	1,024	72.83
	Origin of relationship	Grew up in same	167	17.94	122	8.68
		Met at college or	440	47.26	338	24.04
		Met in social	123	13.21	488	34.71
		Met through others	154	16.54	346	24.61
		Met through online,	47	5.05	112	7.97
	Intimacy	Not especially close	482	51.77	700	49.79
		Especially close	449	48.23	706	50.21
	Geographical proximity	Live within one hour	658	70.68	1,125	80.01
		Live far more than one	273	29.32	281	19.99
	Contact frequency	Met less than at least	297	31.9	366	26.03
		Met more than at least	634	68.1	1,040	73.97
	Social exchanges	Call/text less than at least	105	11.28	209	14.86
		Call/text more than at	826	88.72	1,197	85.14
		Do not socialize	448	48.12	618	43.95
		Socializing together	483	51.88	788	56.05
		Dp not exchange help	282	30.29	523	37.2
		Exchange help	649	69.71	883	62.8
		Do not expect help in an	650	69.82	850	60.46
		Expect help in an	281	30.18	556	39.54
	Relationship tenure (year)	Do not confide or seek	449	48.23	620	44.1
		Confide and seek advice	482	51.77	786	55.9
		5.68	5.37	19.34	14.18	

**Table B.2** Latent Class Goodness of Fit Statistics by Age Group

Young Age group (20~30 years old)		LL	BIC(LL)	AIC(LL)	Npar	Class.Err
M1	1-Cluster	-10306.37	20728.95	20646.73	17	0.00
M2	2-Cluster	-9787.71	19814.68	19645.41	35	0.06
M3	3-Cluster	-9456.33	19274.99	19018.67	53	0.08
M4	4-Cluster	-9272.03	19029.44	18686.07	71	0.07
M5	5-Cluster	-9206.89	19022.21	18591.78	89	0.08
M6	6-Cluster	-9151.94	19035.36	18517.88	107	0.13
M7	7-Cluster	-9098.22	19050.98	18446.45	125	0.13
M8	4-Cluster_relaxed	-9226.37	18958.63	18600.75	74	0.080
M9	4-Cluster +relaxed +RE	-9212.96	18952.31	18579.92	77	0.08

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Table B.2-Continued from previous page

Old Age group (50~70 years old)						
M1	1-Cluster	-17208.48	34540.18	34450.95	17	0.00
M2	2-Cluster	-16689.91	33633.52	33449.82	35	0.07
M3	3-Cluster	-16320.92	33026.01	32747.84	53	0.11
M4	4-Cluster	-16181.38	32877.41	32504.77	71	0.16
M5	5-Cluster	-16090.57	32826.26	32359.15	89	0.17
M6	6-Cluster	-16022.19	32819.98	32258.39	107	0.17
M7	7-Cluster	-15953.05	32812.16	32156.10	125	0.17
M8	4-Cluster-relaxed	-16144.72	32825.82	32437.43	74	0.15
M9	4-Cluster-relaxed+RE	-16118.17	32794.47	32390.33	77	0.15

Table B.3 Conditional Probabilities of Latent Classes by Age Group

	Young	Active Friend	Long distance Friend	Longtime Friend	New Friend
	Size	22.37%	19.18%	16.68%	41.77%
Homophily	Same Age	0.92	0.89	0.90	0.76
	Same Sex	0.85	0.72	0.76	0.65
	Same Race	0.56	0.60	0.57	0.49
	Grown up in same neighborhood or school	0.08	0.14	0.83	0.00
	Met at College or Work place	0.57	0.60	0.02	0.54
Origin of relationship	Met in social organization or neighborhood	0.14	0.10	0.05	0.18
	Met through others	0.16	0.11	0.08	0.22
	Met through online, social event or other	0.05	0.05	0.02	0.06
	Emotional Close	0.80	0.60	0.60	0.21
Geographical Proximity		0.92	0.12	0.67	0.88
	Met more than at least once a month	1.00	0.00	0.52	0.89
Contact frequency	Call/text more than at least once a month	1.00	0.75	0.89	0.89
	Socializing	0.98	0.10	0.51	0.47
Social exchange	Exchanging help	0.87	0.71	0.67	0.61
	Emergency help	0.75	0.04	0.24	0.21
	Advice/Confiding	0.88	0.60	0.60	0.26
Years of Known		4.72	6.44	14.77	2.33

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Table B.3-Continued from previous page

	Old	Active Friend	Long distance friend	Long Time Friend	New Friend
	Size	29.99%	19.64%	25.51%	24.86%
Homophily	Same Age	0.68	0.73	0.47	0.35
	Same Gender	0.90	0.85	0.61	0.73
	Same Race/Ethnicity	0.80	0.79	0.65	0.67
Origin of relationship	Grew up in same neighborhood/school/college	0.08	0.30	0.00	0.01
	Met at Work place	0.25	0.30	0.28	0.14
	Met in social organization or neighborhood	0.36	0.11	0.40	0.47
	Met through others	0.24	0.19	0.28	0.25
	Met through online, social event or other	0.07	0.09	0.04	0.12
Contact frequency	Emotional Close	0.77	0.75	0.25	0.26
	Proximity	0.95	0.32	0.89	0.91
	Met more than at least once a month	0.97	0.19	0.74	0.90
	Call/text more than at least once a month	0.98	0.87	0.67	0.87
Social exchange	Socializing	0.93	0.26	0.40	0.52
	Exchanging help	0.81	0.43	0.56	0.64
	Emergency help	0.69	0.20	0.28	0.31
	Advice/Confiding	0.87	0.77	0.19	0.40
	Average Years Known	21.52	34.03	19.08	5.53

**Table B.4** Estimating Class memberships: Young Age Groups

Young	Active Friend	Long-distance Friend	Longtime Friend	New Friend
Age	0.06 (0.16)	-0.25 (0.20)	0.31 (0.21)	-0.13 (0.14)
Male	0.25 (0.37)	-0.98* (0.49)	0.11 (0.49)	0.61 (0.36)
Female	-0.25 (0.37)	0.98* (0.49)	-0.11 (0.49)	-0.61 (0.36)
Married	-1.28 (0.73)	0.78 (0.88)	0.88 (1.17)	-0.38 (0.76)
Unmarried Partner	0.78 (0.57)	(1.07) (0.79)	0.13 (0.82)	0.17 (0.55)
Single	0.50 (0.56)	0.30 (0.63)	-1.01 (0.76)	0.22 (0.56)

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Table B.4-Continued from previous page

White	0.32 (0.35)	0.16 (0.38)	-1.02* (0.48)	0.54 (0.32)
Non-White	-0.32 (0.35)	-0.16 (0.38)	1.02* (0.48)	-0.54 (0.32)
Less than Bachelor	0.15 (0.70)	0.20 (0.97)	-0.21 (0.96)	-0.15 (0.63)
Bachelor	-0.35 (0.45)	-0.19 (0.58)	0.03 (0.67)	0.51 (0.42)
More than Bachelor	0.20 (0.66)	-0.01 (0.94)	0.18 (1.00)	-0.36 (0.65)
Employed	-0.84 (0.65)	0.86 (0.65)	0.11 (0.73)	-0.14 (0.53)
Student	0.91 (0.52)	-0.43 (0.58)	-0.01 (0.71)	-0.47 (0.47)
Unemployed	-0.07 (0.66)	-0.43 (0.69)	-0.11 (0.76)	0.61 (0.54)
Less than 35k	-1.85** (0.74)	0.61 (0.70)	1.62 (0.84)	-0.38 (0.60)
35k-75k	0.74 (0.59)	-0.59 (0.65)	-0.62 (0.79)	0.47 (0.54)
More than 75k	1.11 (0.64)	-0.02 (0.87)	-1.00 (1.12)	-0.09 (0.75)
Outgoing	0.66 (0.47)	-0.67 (0.58)	-0.82 (0.63)	0.83 (0.46)
Middle	0.86 (0.63)	0.12 (0.62)	0.11 (0.65)	-1.08 (0.60)
Introvert	-1.52** (0.65)	0.55 (0.68)	0.71 (0.69)	0.25 (0.51)
Network Size	0.04 (0.07)	-0.03 (0.08)	-0.12 (0.12)	0.11 (0.08)
Years in Town	0.03 (0.05)	-0.05 (0.05)	0.04 (0.05)	-0.01 (0.04)
Face to Face	-1.60 (1.14)	1.15 (2.37)	2.15 (2.43)	-1.70 (1.13)
Web	1.60 (1.14)	-1.15 (2.37)	-2.15 (2.43)	1.70 (1.13)
Address recruiting	1.76 (1.13)	-1.40 (2.35)	-2.35 (2.42)	1.99 (1.13)
Facebook recruiting	-1.76 (1.13)	1.40 (2.35)	2.35 (2.42)	-1.99 (1.13)

**Table B.5.** Estimating Class memberships: Old Age Group

Old	Active Friend	Long distance Friend	Long Time Friend	New Friend
Age	-0.11 (0.09)	-0.01 (0.10)	0.37 (0.20)	-0.24* (0.10)
Male	-0.46 (0.48)	0.43 (0.47)	-0.78 (0.64)	0.81 (0.45)
Female	0.46 (0.48)	-0.43 (0.47)	0.78 (0.64)	-0.81 (0.45)
Married	-0.11 (0.72)	-2.36** (0.82)	5.20** (1.93)	-2.73** (1.06)
Unmarried Partner	-0.82 (0.64)	-0.28 (0.73)	1.63 (1.42)	-0.54 (0.71)
Widowed/Divorced/ Never Married	0.92 (0.97)	2.64* (1.15)	-6.83* (2.98)	3.27** (1.27)
White	0.16 (0.38)	-0.13 (0.47)	-0.42 (0.53)	0.38 (0.42)
Non-White	-0.16 (0.38)	0.13 (0.47)	0.42 (0.53)	-0.38 (0.42)
Less than Bachelor	-0.50 (0.59)	-0.16 (0.64)	1.71 (1.17)	-1.04 (0.66)
Bachelor	-0.26 (0.49)	0.03 (0.55)	-0.75 (0.90)	0.99 (0.58)
More than Bachelor	0.76 (0.51)	0.14 (0.49)	-0.95 (0.79)	0.06 (0.58)
Employed	-0.15 (0.82)	-2.09* (0.96)	5.42** (2.06)	-3.18** (1.00)
Retired	-1.20 (0.66)	0.48 (0.64)	-0.96 (0.89)	1.67* (0.76)
Unemployed	1.35 (0.77)	1.61 (1.00)	-4.46* (2.07)	1.51 (0.82)
Less than 35k	-2.76* (1.34)	-2.97* (1.31)	8.84** (3.38)	-3.12* (1.32)
35k–75k	1.51* (0.60)	-0.85 (0.87)	-1.14 (1.05)	0.49 (0.69)
more than 75k	1.25 (1.12)	3.82*** (1.18)	-7.70* (3.20)	2.63* (1.33)
Out-going	-0.42 (0.53)	-1.73* (0.69)	2.48* (1.24)	-0.33 (0.72)
Middle	-1.32* (0.66)	-0.22 (0.86)	0.68 (1.32)	0.86 (0.80)
Introvert	1.74* (0.74)	1.95** (0.73)	-3.16* (1.61)	-0.53 (0.88)

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Table B.5-continued from previous page

Network Size	-0.16 (0.08)	-0.05 (0.10)	0.16 (0.11)	0.05 (0.10)
Years in Town	0.02 (0.02)	-0.03 (0.03)	0.06 (0.04)	-0.04 (0.03)
Face to Face	0.23 (0.38)	0.75 (0.45)	-1.21 (0.76)	0.23 (0.47)
Web	-0.23 (0.38)	-0.75 (0.45)	1.21 (0.76)	-0.23 (0.47)

## Appendix C

### Appendix to Chapter 4: With Whom do older adults do what and how does that change with aging?

**Table C.1** Descriptive statistics

Variables		Total	50~54	55~59	60~64	65~70
		(Nr* =671 Na* =6,219)	(Nr =128 Na=1,221)	(Nr =135 Na=1,267)	(Nr =176 Na=1,612)	(Nr=232 Na=2,119)
		%	%	%	%	%
Emotional closeness	Non-close ties	50.25%	55.69%	47.91%	48.57%	49.79%
	Close ties	49.75%	44.31%	52.09%	51.43%	50.21%
Age homophily	Different age	54.32%	49.30%	52.57%	55.58%	57.29%
	Same age	45.68%	50.70%	47.43%	44.42%	42.71%
Gender homophily	Different gender	36.13%	34.15%	37.88%	36.10%	36.24%
	Same gender	63.87%	65.85%	62.12%	63.90%	63.76%
Proximity	Within one-hour drive	77.04%	78.71%	77.98%	75.81%	76.45%
	More than one-hour drive	22.96%	21.29%	22.02%	24.19%	23.55%
Kinship	Kin	62.05%	67.24%	57.70%	62.66%	61.21%
	Non-Kin	37.95%	32.76%	42.30%	37.34%	38.79%
Role relationship	Spouse/Romantic partner	6.98%	6.63%	7.42%	6.82%	7.03%
	Parent	3.78%	6.06%	6.00%	2.92%	1.79%
	Child	8.70%	5.24%	8.05%	8.81%	11.00%
	Sibling	8.14%	8.60%	9.16%	8.06%	7.31%
	Other relates	10.63%	6.47%	12.23%	10.79%	11.94%
	Friend	37.56%	39.15%	34.41%	38.21%	38.04%
	Workmate	8.49%	11.06%	8.92%	10.73%	5.05%
Organization Mate	Organization Mate	5.31%	5.73%	5.29%	4.34%	5.80%
	Neighbor	7.41%	7.86%	5.84%	6.08%	9.11%
	Acquaintance	3.01%	3.19%	2.68%	3.23%	2.93%

\* Nr=Number of respondents, Na=Number of alters.

**Table C.2** Model selection

	LL	BIC(LL)	Npar	Class.Err.
1class	-22467.5	44987.3	6	0
2class	-21630.3	43374.09	13	0.06
3class	-21074.9	42324.34	20	0.1258
4class	-20833.7	41903.04	27	0.1721
5class	-20598.1	41493.01	34	0.1684
6class	-20364.3	41086.46	41	0.102
7class	-20188	40795.06	48	0.0734
8class	-20161.8	40803.77	55	0.0896
5model_modify1	-20415.7	41145.7	36	0.1188
5model_modify2	-20411.8	41146.66	37	0.0552
6model_modify1	-20406.3	41179.31	42	0.1145
6model_modify2	-20189.6	40754.5	43	0.0787
<b>6model_modify3</b>	<b>-20177.2</b>	<b>40738.49</b>	<b>44</b>	<b>0.0956</b>
7class_modify1	-20197.3	40822.33	49	0.0972
7class_modify2	-20156.3	40749.16	50	0.0935
7class_modify3	-20149.8	40744.75	51	0.1397

**Table C.12** Conditional probability of six latent classes

	Help receiving	Counseling	Socializing	Multiple involving	Help exchanging/Socializing	Providing Practical help
Size	17.53%	16.13%	24.88%	19.17%	17.04%	5.26%
Socializing	0.2827	0.2697	1.000	0.8687	0.4733	0.1673
Confiding	0.0635	0.5983	0.0461	0.9131	0.0555	0.0629
Advice	0.0002	0.6248	0.0002	0.7152	0.1288	0.0082
Practical Help	0.1021	0.0423	0.0007	0.2786	0.2585	0.9994
Emergency Help	0.0052	0.002	0.0004	0.7105	0.9995	0.0175
help out	0.9999	0.2257	0.0009	0.6701	0.4343	0.0094

**Table C.13** Characteristics of six activity involvement pattern groups

	Help receiving	Counseling	Socializing	Multiple involving	Help exchanging/Socializing	Practical help providing
Closeness	30.5%	58.3%	26.1%	82.7%	47.1%	21.9%
Same age	28.5%	47.6%	44.3%	54.9%	39.4%	42.6%
Same sex	67.3%	65.4%	63.4%	63.6%	59.1%	54.4%
Proximity	76.6%	55.9%	82.6%	87.6%	85.9%	72.8%



**Table C.14** Distribution of six social exchange patten groups across role relationships

	Help receiving (17.53%)	Counselling (16.13%)	Socializing (24.88%)	Multiple involving (19.17%)	Help exchanging/ Socializing (17.04%)	Practical help providing (5.26%)
Spouse /Partner	1.90%	8.20%	6.83%	69.89%	13.18%	0.00%
Parent	23.29%	32.04%	4.62%	19.07%	20.02%	0.96%
Child	20.26%	12.43%	12.15%	20.07%	33.22%	1.88%
Sibling	11.13%	36.70%	7.11%	21.94%	19.85%	3.27%
Other relate	22.47%	9.39%	31.66%	5.17%	23.23%	8.08%
Friend	15.32%	12.66%	36.83%	18.45%	12.01%	4.73%
Workmate	23.58%	27.29%	21.65%	10.75%	7.41%	9.32%
Org mate	21.71%	23.12%	26.87%	10.35%	14.47%	3.49%
Neighbor	25.21%	4.30%	20.80%	12.58%	23.53%	13.58%
Acquaintance	18.32%	15.88%	43.40%	0.42%	10.14%	11.84%

**Table C.6** Distribution of six social exchange patters by age groups

		Help receiving	Counseling	Socializing	Multiple involving	Help exchanging /socializing	Providing Practical help
50~ 54	Overall	18.24%	17.04%	24.13%	18.24%	16.72%	5.63%
	closeness	0.365	0.539	0.308	0.818	0.459	0.080
	same age	0.319	0.453	0.476	0.745	0.406	0.455
	same sex	0.708	0.600	0.653	0.697	0.591	0.534
	Proximity	0.690	0.518	0.886	0.951	0.883	0.692
55~ 59	Overall	17.04%	14.26%	25.28%	17.34%	18.64%	7.43%
	closeness	0.206	0.548	0.205	0.741	0.391	0.276
	same age	0.289	0.472	0.451	0.472	0.365	0.461
	same sex	0.751	0.693	0.605	0.671	0.678	0.627
	Proximity	0.771	0.656	0.836	0.862	0.814	0.608
60~ 64	Overall	21.26%	15.88%	26.31%	18.07%	14.10%	4.38%
	closeness	0.225	0.584	0.227	0.855	0.493	0.224
	same age	0.215	0.479	0.388	0.499	0.438	0.310
	same sex	0.657	0.692	0.658	0.586	0.534	0.596
	Proximity	0.812	0.548	0.825	0.845	0.837	0.864
65~ 70	Overall	18.15%	16.09%	24.51%	19.01%	18.26%	3.97%
	closeness	0.384	0.584	0.253	0.843	0.473	0.244
	same age	0.275	0.440	0.398	0.451	0.339	0.379
	same sex	0.623	0.641	0.655	0.606	0.575	0.401
	Proximity	0.761	0.521	0.773	0.853	0.891	0.843

**Table C.7** Distribution of social exchange patterns in role relationships by age group

Age	Role relationship	Help receiving	Counseling	Socializing	Multiple involving	Help exchanging/ Socializing	Practical help
	Overall	18.24%	17.04%	24.13%	18.24%	16.72%	5.63%
50~ 54	Spouse/Partner	0.054	0.037	0.069	0.730	0.111	0.000
	Parent	0.201	0.325	0.000	0.250	0.222	0.003
	Child	0.431	0.059	0.264	0.014	0.232	0.000
	Sibling	0.084	0.426	0.140	0.159	0.158	0.032
	Other relate	0.181	0.107	0.229	0.057	0.292	0.134
	Friend	0.155	0.113	0.357	0.186	0.154	0.035
	Workmate	0.334	0.277	0.112	0.148	0.041	0.089
	Org mate	0.091	0.343	0.326	0.038	0.165	0.037
	Neighbor	0.152	0.031	0.243	0.153	0.209	0.212
	Acquaintance	0.073	0.213	0.455	0.005	0.156	0.098
	Overall	17.04%	14.26%	25.28%	17.34%	18.64%	7.43%
55~ 59	Spouse/Partner	0.004	0.113	0.048	0.735	0.100	0.000
	Parent	0.217	0.347	0.095	0.169	0.174	0.000
	Child	0.125	0.129	0.088	0.251	0.400	0.008
	Sibling	0.103	0.329	0.078	0.206	0.213	0.071
	Other relate	0.226	0.067	0.351	0.033	0.220	0.104
	Friend	0.135	0.085	0.375	0.169	0.174	0.062
	Workmate	0.212	0.169	0.222	0.084	0.084	0.230
	Org mate	0.228	0.294	0.161	0.126	0.150	0.042
	Neighbor	0.282	0.024	0.267	0.154	0.154	0.119
	Acquaintance	0.274	0.111	0.327	0.012	0.151	0.125
	Overall	21.26%	15.88%	26.31%	18.07%	14.10%	4.38%
60~ 64	Spouse/Partner	0.003	0.105	0.034	0.712	0.147	0.000
	Parent	0.318	0.270	0.065	0.148	0.163	0.036
	Child	0.244	0.124	0.140	0.187	0.268	0.038
	Sibling	0.136	0.317	0.015	0.327	0.188	0.018
	Other relate	0.189	0.093	0.368	0.069	0.227	0.054
	Friend	0.200	0.152	0.370	0.171	0.060	0.047
	Workmate	0.270	0.300	0.297	0.028	0.088	0.017
	Org mate	0.333	0.085	0.355	0.099	0.117	0.011
	Neighbor	0.381	0.045	0.090	0.091	0.271	0.123
	Acquaintance	0.165	0.064	0.565	0.000	0.029	0.178

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Table C.7-Continued from previous page

	Overall	18.15%	16.09%	24.51%	19.01%	18.26%	3.97%
	Spouse/Partner	0.022	0.062	0.114	0.648	0.152	0.002
	Parent	0.294	0.275	0.034	0.077	0.319	0.000
	Child	0.134	0.158	0.052	0.264	0.369	0.024
	Sibling	0.137	0.396	0.054	0.148	0.246	0.019
65~	Other relate	0.311	0.120	0.288	0.030	0.202	0.049
70	Friend	0.143	0.151	0.377	0.192	0.093	0.045
	Workmate	0.079	0.287	0.274	0.235	0.112	0.012
	Org mate	0.309	0.144	0.225	0.151	0.128	0.043
	Neighbor	0.266	0.076	0.227	0.065	0.275	0.091
	Acquaintance	0.247	0.269	0.348	0.008	0.085	0.044