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Exclusion and Old Age

An environmental perspective on social exclusion in later life in Germany

Master Thesis

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By

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Abstract

Current demographic trends show that Germany is an aging society. While this is nothing new, in recent times also spatial patterns are changing. The former East-West divide is not as decisive as it was a few decades back. More importantly, the country is witnessing a divide between central and peripheral areas that leaves the latter in a disadvantaged and left behind position. This study builds on the previous findings that older people are especially vulnerable to social exclusion by examining the relationship of area structure on two domains of social exclusion in old age. Results show that capital is cumulative and financial resources still have a strong impact on exclusion from civic participation and social relations. Exclusion from civic participation varies across districts, though a small sample size prevents significant effects in the most comprehensive model. Future research must focus on a more complex definition of centralisation and utilize mixed methods designs.

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I. Introduction

During the past seven decades, multiple societal trends have changed the social structure and everyday life in Germany. The second demographic transition, urbanisation and globalisation have altered the social composition and contextual outline in German villages and cities. Decreasing birth rates and an increasing life expectancy have let the average age of the population to rise and rural-to-urban migration left many regions economically deprived and with hardly any employment (e.g. Eichhorn 2007). While young and working-aged people are migrating into more central and urban areas in search for employment, better services and more amenities, older people are often staying behind in peripheral and rural areas. Because the scope of action decreases with declining health and people are more and more restricted to their immediate environments, districts – regardless of their level of urbanisation – are challenged to enable social participation and promote independence for an increasingly old and growing share of their population. Various studies expected different environmental resources for social integration and participation in different spatial areas, however, evidence is mixed (Huxhold; Fiori 2018). Both urban and rural environments bring supportive and impeding structures for *Aging in Place*. While in rural environments inhabitants may for example have built strong relationships and established social roles within the community over decades (Birrer-Hardwick; Greenwood 2017), urban regions provide better infrastructure and means of transportation that would support maintenance of networks (Huxhold; Fiori 2018). Social capital has proven to be a key indicator of successful aging as it affects individual's physical and mental health directly and indirectly. However, access to social capital is still strongly dependent on the individual's socioeconomic status and thus even more entrenched in later life, as income mobility is limited (e.g. Erlinghagen Hank 2019; Knack, Keefer 1997). In order for a country and ultimately a region to be able to cope with the predicted growth in elderly population, it is important for policy makers to know which subgroups are especially vulnerable to social exclusion and which factors promote social exclusion in old age. One challenge Germany is facing is to ensure inclusion and participation for its elderly citizens across the whole country and thereby not only promote a high quality of life, health and well-being (van Bergen et al. 2019) but also ensure exercisability of civil and social rights (Marshall 1950).

Against the background of *Social Capital Theory* (Bourdieu 1986; Putnam 2000) and using an environmental perspective (Keim 2006), this research investigates whether the existence of financial resources still prevents exclusion from social relations and exclusion from civic participation. Does the level of centralisation affect the likelihood of exclusion from social relations and civic participation? Does the effect of financial resources on exclusion from social relations and civic participation vary between the districts depending on their level of centralisation? Answering these questions, this thesis will add to the existing knowledge on the interaction of different forms of capital and highlight indicators of challenges in the exercisability of basic rights in Germany.

The second chapter will elaborate on the theoretical background of this thesis. First, Social capital approaches as formulated by Pierre Bourdieu (1986), James Coleman (1988) and Robert Putnam (2000) are differentiated, then an explanation of the environmental concept of *Centralisation* and *Peripheralisation* by Keim (2006) is given and finally current research on old age exclusion and environmental contexts as well as the research's hypotheses are presented. Chapter three outlines the empirical analysis by describing the data set, the operationalisation of concepts as well as a first descriptive analysis and the following multilevel logit regression. The thesis concludes with a discussion of the results and final remarks on future research.

2. Theoretical Background

"Die Kapitallosigkeit kumuliert die Erfahrung der Endlichkeit: an einen Ort gekettet zu sein"[1]

(Bourdieu 1991: p. 30)

The concept of social exclusion is being used in scientific research since the late 1970s (e.g Townsend 1979). Over the last 40 years, the definition of social exclusion has developed from a rather narrow perspective focusing only on economic factors to a multidimensional phenomenon. Social exclusion then refers "to the dynamic process of being shut out, fully or partially, from any of the social, economic, political or cultural systems which determine the social integration of a person in society." (Walker and Walker 1997: p. 8). Though financial deprivation and poverty is still an important dimension of social exclusion, the new concept provides a more comprehensive approach to understand the barriers to participation in society and how they impede the realisation of civil, political and social citizenship rights (Marshall 1950; Room 1995; Tsakloglou & Papadopoulos 2002).
Social exclusion is understood to always be *relative* in two aspects: relative to other individuals who are not excluded from a certain object or act and relative to the overall society and prevailing norms (Walsh et al. 2017). Furthermore, exclusion is always product of an act of exclusion in which someone is either excluded against their will, lacking the agency to achieve integration for themselves or choosing to exclude themselves from mainstream society. Based on a literature review, Walsh et al. (2017) identified six dimensions of old age social exclusion: material and financial resources, services, amenities and mobility, social relations, civic participation, neighbourhood and community, socio-cultural aspects of society. These six dimensions consist of objective and subjective indicators, whereby the latter are subject to individual preferences, needs and aspirations. Over their life course, individuals are moving in and out of exclusion (dynamic) and experiencing different forms of exclusion over time (processual). The specifications and particularities of old age exclusion will be described in chapter 2.3.

In order to understand old age exclusion and the conceptual framework of this research, it is important to know the theoretical background it is derived from. In social sciences, research on social isolation and social connectedness in old age often draws on social capital theory. The following research will look at old age exclusion against the background of unequally distributed capital resources and respectively different opportunities in life. While the focus of this paper will be financial and social capital, other forms of capital are discussed in the respective literature. Therefore, a short review of work in the field will present the most important conceptualisations. The first subchapter of this thesis will elaborate on the social capital theory proposed by Robert Putnam (2000) and differentiate his theory from his colleagues' approaches. Further subchapters will discuss current theories on developments in Germany regarding centralisation and rural-urban migration. A last subchapter outlines social exclusion, its mechanisms and describes how old age exclusion differs from exclusion in other life stages.

2.1 Social Capital Theory

Social capital can generally be understood as a social entity, which, if invested in, is an amplifier of agency for those who have access to it (Qi 2018). A number of different scholars have worked with the notion of social capital (e.g. Bourdieu 1986; Coleman 1988; Putnam 1993) in order to explain social class conflicts (Bourdieu 1986), the functioning of economic

[1] Engl. Translation: Capitallessness accumulates the experience of finiteness: being chained to one place.

and political systems (Putnam 1993) or simply inequality in individual life chances (Coleman 1988). Amongst the best-known contributors are Pierre Bourdieu (1986), James Coleman (1990) and Robert Putnam (2000). The different ideas of these three scholars will be outlined shortly and discussed regarding this research's objective afterwards.

2.1.1 Pierre Bourdieu's Formulation

For Bourdieu, the notion of capital is indispensable in describing the social world appropriately as it allows for the idea of accumulation and its effects on social space (Bourdieu 1986). In its most basic form, Bourdieu understands capital as materialised or incorporated "accumulated labour" (ibid.: p. 46) that enables "agents or groups of agents" (ibid.) to "appropriate social energy in the form of reified or living labor" (ibid.). However, the distribution of capital differs from pure chance as capital is accumulated over time, potentially produces profits, "reproduce[s] itself in identical or expanded form" (ibid.) and persists over time, leading to inequal possibilities for all members of society (ibid.). In order to be able to describe all practices and exchanges in a society, Bourdieu distinguishes three different types of capital that can be transformed into one another: economic capital, cultural capital and social capital. Economic capital can be directly converted to money and "may be institutionalized in the form of property rights" (ibid.). Furthermore, all other types of capital can be derived from it. While cultural capital is understood as cultural goods such as books or machines, dispositions of mind and body (habitus) and educational qualifications, social capital "is the aggregate of the actual or potential resources" (ibid.: p. 51) linked to the membership of individuals in specific groups "which provides each of its members with the backing of the collectivity-owned capital" (e.g. the name of a family; ibid.). Unlike Coleman and Putnam, Bourdieu distinguishes social capital from collective assets such as culture, norms and trust but defines it as material and symbolic profits derived from exclusive relations (ibid.). For Bourdieu, every profit from economic, cultural and social capital is in the end reducible to economic profit (Tzanakis 2013).

2.1.2 James Coleman's Formulation

In his work, Coleman manages to find a middle ground between the economic perspective on social capital based on rational theory and utility-maximization and a functionalist perspective in which social action is conditioned by social structure (Qi 2018). He differentiates between financial, human and social capital. Similar to Bourdieu's model, financial capital can be measured in wealth or income while human capital can be measured in education. Social capital on the other hand is understood quite differently as inherent to the structure between and among actors (Coleman 1988). Social capital consists of various aspects of social structure, which "facilitate certain action of actors […] within the structure" (ibid.: p. 98). These aspects are explicitly social norms that govern individuals' behaviour and resources that provide opportunities and support to their everyday life. While both Bourdieu and Coleman emphasize the embeddedness of individuals in social structure (Bourdieu: social space and positions), Coleman understands social capital as a bonding mechanism adding to the integration into social structure by fostering obligations, expectations, trust and the development of channels of information within society (ibid.). But social relationships can also enforce norms, impose sanctions and enable the flow of goods and services and hence create resources of its own. The social capital framework poses that individuals with more and better social connections can activate greater resources and therefore navigate the life course more successfully (Wong, Waite 2016). For Coleman, social capital is available for all social actors, regardless of other forms of capital and only beneficial for the individual. Compared to Bourdieu's formulation, social capital is here far more public and accessible for everyone. His concept is strongly influenced by social network theories of Granovetter (1973) and focusses on strong ties of kinship and neighbourhood community.

2.1.3 Robert Putnam's Formulation

Putnam extends Coleman's formulation of social capital in many ways, but different from Coleman, Putnam focusses on civil engagement and voluntary organisations. Following, social capital is understood as "features of organizations, such as networks, norms and trust that facilitate action and cooperation for mutual benefit" (Putnam 1993a: p. 35). Furthermore, it is – similar to Coleman's view – an engine of interpersonal cooperation. Putnam also highlights the importance of norm production, reciprocity and trust in social capital when he connects both phenomena to the occurrence of civic engagement. Because individuals have less time on their hands to participate socially due to two-career families and travel time in urban areas as well as increasingly available home entertainment opportunities like television or the internet, reciprocity declines and so does trust (Putnam 1993b). The argumentation goes that as the means to achieve cooperation decrease, the possibilities of cooperation decrease as well, because trust "lubricates cooperation […] [a]nd cooperation breeds trust" (Putnam 1993b: p. 171). In Putnam's formulation, social capital can both be inclusive ("bridging") as described by Coleman and exclusive ("bonding") which approximates the definition of Bourdieu (Putnam 2000; Qi 2018). While bridging social capital extents trust from social primary groups to external groups in society, bonding social capital describes close kinships that deepen individuals' identities.

2.1.4 Summary

All three concepts draw on parts of their predecessor's work and shift the focus of social capital on different aspects of social relations. Most interestingly, all scholars come from different perspectives and apply their definitions of social capital on different social phenomena. Both Coleman and Putnam emphasize the meaning of expectation, trust and norms derived from social capital and detach the concept from Bourdieu's purely economic perspective. However, in all the formulations the importance of capital – be it financial, human or social – is evident and transferrable to the issue of old age exclusion as will be elaborated upon in Chapter 2.3. Due to Putnam's close interrelation of social relations and civic participation, his understanding is building the foundation of what is meant by social capital in this thesis.

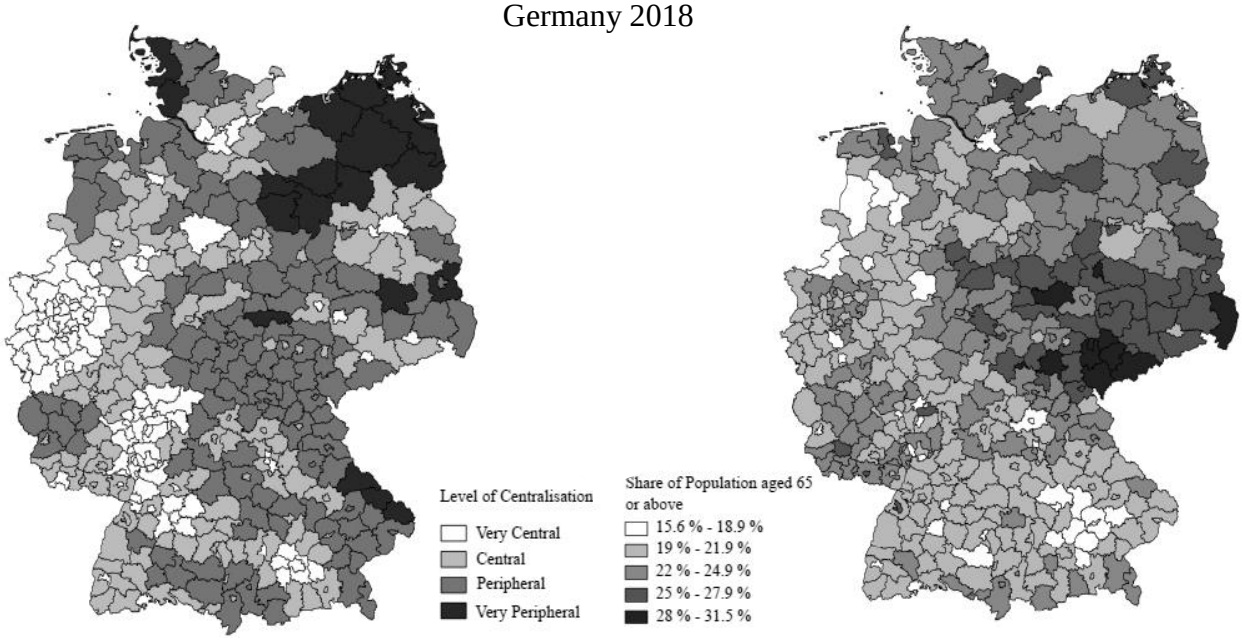
2.2 Centralisation and Urbanisation

Almost 80 percent of the German population are living in urban regions of the country. These rural-urban trends in migration are visible all over the world and contribute not only to a growing urban population but also to a declining rural population. Following the classification of BBSR (2012), the level of urbanisation can be differentiated into four categories based on population density, leaving many aspects of space unnoticed. 13 years ago, Keim (2006) introduced the concepts of centralisation and peripheralisation that should shift the perspective on regional developments and was used and discussed in many recent papers and books (e.g. Neumann, Fischer-Tahir 2013; Kühn 2015; Eder 2019). Especially when talking about social justice, spatial dependencies and (political/economic) power, looking at peripheralisation instead of urbanisation has proven to be a fruitful (Kühn 2014, Eder 2019).
Following the author, processes of centralisation and peripheralisation are closely related with the current migration dynamics and lead to several functional interlinkages that characterise peripheralisation especially in contrast to centralisation and vice versa. Spatial centralisation – for example in urban regions – determines to a large extent peripheralisation by accumulating population, productivity as well as infrastructure while at the same time depriving other regions. Peripheralisation is of procedural nature and can be understood as the gradual weakening and/or decoupling of social-spatial development in contrast to the dominant developments in centralisation (ibid.). Peripheralisation is characterised by a weakening of economic efficiency and drastic changes in regional settlement structures. The more successful the accumulation of economic functions in urban regions and the less these

accumulations are dependent on autonomous productivity in rural regions, the greater the economic peripheralisation (ibid.). Because only a limited amount of economic investment, productivity and occupation is possible, dynamics of the market create "winners" and "losers" that translate into regions of centralisation and peripheralisation (ibid.). Additionally, these dynamics also contribute to changes in settlement structures. Demographic transition and with that an aging society, a declining birth rate and overall population loss as well as a dysfunctional social and technical infrastructure lead to empty residential housing, bad traffic connection, elimination or amalgamation of educational institutions, poor accessibility of services and the lack of a critical mass for municipal self-government. As a consequence, contractions in functional, economic, social and cultural fields of society as well as stigma through symbolic (mis-)representation and subjective assessment emerge and leave rural peripheral regions in a losing position (ibid.). In addition, Neu describes in her 2006 essay on spatial inequality an absence of power potential, a phenomenon she calls *distance from power* (*Machtferne*), in peripheral regions. She elaborated that distance from power and capitallessness promote spatial and social decoupling processes with functional urban areas or anchor cities that concentrate funding (Neu 2006). What follows is a further reduction in subsidies for peripheral regions and thus the dismantling of technical and social infrastructure. The small and often unconnected activities on village or municipality level against these cuts are rarely effective, promoting the increasing distance between local actors and centres of power (ibid.).

Because of this more dynamic understanding of space, concepts of centralisation and peripheralisation are utilized in this thesis instead of urbanisation. Furthermore, space is understood to be a modifiable product of human interaction through the storage, positioning and arrangement of goods and bodies. At this point it is possible to refer to Bourdieu's theory on social space in order to be able to link the concepts of social, economic and cultural or human capital to space (Bourdieu 1991). His idea was that by looking at the relation between the types of capital, an individual can be localised in a "space of position" regarding capital volume and structure (relative share of different types of capital). The space of position is complemented by a "space of perspectives" for subjective perceptions and assessments of the individual's environment. This allows for the representation of stigma and feelings of being

Figure 1: Level of Centralisation (left) and Share of Population Aged 65 and Above (right), Germany 2018



Source: Destatis 2018, GeoBasis-DE / BKG 2019, own calculation and presentation

“left behind” within the theory. Bourdieu also described interactions between social space and physical space. For him, social hierarchy is always represented in the arrangement of individuals in physical space. Resources and individuals are therefore distributed unevenly across physical space, with some areas having high levels of scarce resources as well as privileges and others having (far) less (Neu 2006). Furthermore, if individuals have access to a larger amount of resources – or capital – they are able to exercise a greater influence on physical space itself. For example, ownership over land enables the individual to exclude other people from these spaces or open up exclusive spaces.

The other way around, individuals without capital are forced to abstain from scarce goods. Accordingly, capitallessness cumulates the experience of being tied to a place (Bourdieu 1991). Peripheralisation reduces the access to resources such as education, occupation and social networks and therefore scopes of action. Individuals in possession of capital and the ability to transform it migrate to more attractive environments while people that do not have access to these resources are left in regions that lack desirable goods and services. Figure 1 depicts the share of elderly people in Germany as well the level of centralisation[2] in Germany’s districts (Landkreise) using register data. Not only does it indicate a higher share of elderly people in rather peripheral areas, it also highlights the unequal distribution of central areas and elderly people in Germany. From 1991 to 2012 the population of East Germany decreased by two million, due to high mortality and low fertility rates as well as internal migration (BBNB 2019). Notably, aging in East Germany is mainly caused by emigration of young people, while in West Germany the amount of elderly people increases. However, during the last years, some large cities in East Germany were able to stabilize their population or even grew in size (ibid.). This progress emphasizes the uneven development of central and peripheral as well as structurally strong and weak regions. Today many West German districts show more and more demographic issues similar to those that have been existing in mostly East German districts for years (ibid.). The level of centralisation and the share of population aged 65 and above correlate at 0.4, indicating that a greater share of elderly people is living in rather peripheral areas and that shares of elderly people are unevenly distributed across Germany. These findings resonate with current developments all over Europe as a result of continuing demographic shifts. Additionally, while some rural areas still attract incoming migrants, others are threatened by significant depopulation (Scharf, Phillipson 2005).

But how are the different environments and their recent developments influencing people in later life? The following chapters will elaborate on these questions and outline the most important differences in central and peripheral environments for elderly people.

2.2.1 Old Age in Central and Peripheral Environments

With increasing age, individual’s scope of action decreases and elderly people become increasingly focused on action within close social and geographical proximity (Kricheldorff, Oswald 2015). Biological processes lead to a decrease in muscle strength and joint mobility as well as to impaired senses, insecurity and a higher risk of falling (Brüchert, Quentin 2018). Furthermore, as the physical health of elderly individuals decays, social contacts and activities become increasingly restricted to immediate environments (Oswald et al. 2005).

Classic studies on the elderly population have focused on urban[3] societies (Townsend 1957; Clark 1971; Scharf/Phillipson 2005) in Great Britain and the US. Research on rural elderly

[2]See chapter on operationalisation (3.2) for detailed information on variable construction.

[3] Note that sometimes the concepts urban/rural are used instead of central/peripheral. While the concepts do overlap, their differences should not be overlooked. However, because of their proximity, they are used in

dwellers was conducted by Blume (1969) and Rosenmayr (1982) on Germany, France (Cribier 1973), and the US (e.g. Coward, Lee 1985). These studies substantiate the importance of environmental perspectives in gerontology and highlight context specific problems of the elderly population. In their 2005 paper on rural and urban perspectives on growing old, Scharf and Phillipson (2005) elaborate on current environmental changes in Europe and the importance of rural and urban gerontology. Globalisation, demographic change, changing infrastructure and budget pressure are affecting urban and rural areas differently, being an amplifier to the urban/rural divide (Scharf, Phillipson 2005) and impetus for new and important research questions. In many rural areas in Europe, the population is decreasing and many infrastructural facilities, such as public transportation, local shops or health services cannot be maintained due to lacking spending power. The restructuring of health and social care policies in almost all European nations since the 1970s has led to further vulnerability of the elderly individual as support is increasingly demanded from close social contacts, especially if the gradual loss of essential facilities in rural areas continues (ibid.). According to classic studies in the field, elderly people are facing a number of specific challenges in later life, such as preserving an as-independent-as-possible everyday life despite physical and mental impairments. If no relocation is planned and individuals prefer to age in place, new individual conditions have to be adapted to environmental resources in the home environment (ibid.). The well-used policy phrase *Aging in Place* is defined as "remaining living in the community, with some level of independence, rather than in residential care" (Davey et al. 2004: 133) and claims that people prefer to age in their own homes as it enables them to maintain more independence, autonomy and contact to family and friends.

With the increasing spatial concentration of the German population, cities are undergoing major changes in recent years. First, processes associated with globalisation lead to a concentration of wealth in some areas, while amplifying a decline in others (centralisation vs. peripheralisation, Sassen 2001; Scharf, Phillipson 2005). A number of studies suggest that Aging in Place in urban areas, especially deprived urban areas, "creates significant risks both for older people and those concerned with the delivery of services" (Scharf, Phillipson 2005: p.70). These findings add to the perception that urban environments are unsuited for the needs of elderly people. Studies have further investigated different ways in which urban environments promote processes of in- or exclusion among elderly people, especially looking at physical fabric of cities, population dynamics and crime rates (e.g. Phillipson et al. 2001; Scharf et al. 2002; Newman 2003; Scharf, Phillipson 2005). Klinenberg (2002) and Scharf et al. (2002) found that environmental contexts produce pressures on elderly inhabitants to disengage from mainstream social life and that new forms of vulnerability are appearing in urban environments, such as isolation of poor individuals, degradation of low-income housing, and the restructuring of health and social care services. The studies assessed that high-crime areas, deteriorating public space and abandoned buildings, poor infrastructure and the loss of local businesses reinforced restrictions on daily living, especially when declines in heath and support networks were also recorded (e.g. Newman 2003; Scharf, Phillipson 2005). The importance of social capital on mobility among elderly people in the understanding of Putnam (2000) was highlighted by many researchers (Newman 2003; Phillipson et al. 2004; Klinenberg 2002). In respect to social relations, research (Scharf et al. 2001; Hofferth, Iceland 1998) shows that in large cities, older individuals have on average fewer friends, less contact to neighbours and non-kin and a weaker sense of responsibility to others than in rural areas.

similar contexts in related research and therefore acknowledged in this literature review. If reviewed studies used the concepts of urbanisation, they are referred to as such.

Because fewer children and siblings live nearby, contacts are often met outside of the immediate neighbourhood and local core networks tend to be small.

2.2.2 Summary

This subchapter showed that centralisation and peripheralisation are interacting processes that restructure the context and composition of German districts. This trend is ongoing and emphasises the importance of not only looking at East-West but also centre-periphery differences. These dynamics can be translated into Bourdieu's idea of different forms of capital being distributed unevenly across physical space. While central areas in Germany accumulate capital and attract individuals, peripheral areas do not. Being in the possession of capital then enables the individual to choose their place of residency and enlarges their scope of action in disadvantaged environments. Most of the research done from his perspective utilized the concept of urbanisation and reported differences between urban and rural environments especially in two perspectives: (1) Number of leisure facilities, activities and general services and (2) Structure and resilience of social networks. Different from younger, more mobile people, for elderly individuals "the home place sets the tone for their daily lives" (Newman 2003: p. 199) as restrictions in physical and mental health as well as environmental characteristics limit their scope of action. Aging in Place can be expected to leave challenges for both kinds of environments.

2.3 Exclusion and Age

With increasing life expectancy and the development and establishment of a life course regime that is organised around the employment system, retirement became a biographically expectable phase of life that is largely open to individual organisation (Kohli 1985, Künemund 2001). Retirement transformed from being a "remaining period" for a small group to an independent phase of life in which almost one third of the German population finds itself (e.g. Künemund 2001) with increasingly better education and better health (ibid.). This new phase of life remains linked to the employment system in a variety of ways (see chapter 2.3.1) but participation in society can no longer be achieved through gainful employment. Therefore, alternative forms of participation become the centre of peoples' lives and include older people civilly and socially (Kohli et al. 1993). Relating to Erlinghagen and Hank (2019), *civic participation* will be used as an umbrella term in this study, combining activities from both social and political participation. While social participation defines public and collective activities without political motivation but outside the private sphere (Roßteutscher 2009), political participation is any activity pursued voluntarily and outside of professional contexts that aims to influence decisions on personnel and matters or to contribute in executing these decisions (Verba et al. 1995). Activities within the family, such as visits, care or nursing activities but also meetings with close friends in private settings are being subsumed by the term *social relations* or sometimes social participation.

But why are social relations and civic participation important for society and elderly individuals? Questions of civic participation and social relations are particularly important when it comes to addressing and responding to the specific challenges of individual and population aging (Erlinghagen, Hank 2019). Age specific life events, such as widowhood and withdrawal from gainful employment, can lead to restricted participation opportunities as will be shown in the following chapters. Civic participation and social relations can protect elderly individuals from loneliness and social isolation, preserve their physical and mental health and strengthen social cohesion (Leone, Hessel 2016; Erlinghagen, Hank 2019). Social capital in all its forms has proven to be cumulative and promote successful aging. Additionally, facing a growing share of elderly people, it is unavoidable to encounter questions regarding the marginalisation and discrimination of elderly people and find inaccessibility of many social institutions (e.g. physical, cognitive or content-wise).

In this paper, social exclusion in old age is being viewed as a multidimensional phenomenon with important manifestations in financial resources, social relations and civic participation. Financial resources, social relations and civic participation are three possible but not the sole dimensions in which social exclusion can affect elderly individuals (see chapter 2). Over the life course, individuals experience different forms of exclusion that vary between life stages and depend on abilities to participate in everyday activities that are typical for people in the respective life stage (e.g. education, labour market). Old age is characterised by the transition from labour market participation to retirement and dependency on pensions. Research shows that older people are especially vulnerable to social exclusion due to these age-related events. This includes a greater risk of reduced mental health, illness or physical impairment, increasing dependency and less autonomy, loss of close social contacts due to death or migration as well as age-related discrimination and ageism (Van Regenmortel et al. 2016). In order for a country and in the end municipalities to be able to cope with the predicted growth in elderly population, it is important for policy makers to know which subgroups are especially vulnerable to social exclusion and which factors promote social exclusion in old age. How social exclusion manifests in financial resources, civic participation and social relations will be explained in the following subchapters.

2.3.1 Financial Resources

In Germany, the legal retirement age is 65 years. Between 2015 and 2016, the share of individuals in retirement age that are at risk of poverty rose from 16.5 to 17.6[4]. People aged 65 and above are now more likely to struggle with poverty than children or the working-age population (Destatis 2017). Women are especially at risk of poverty with a share of 19 % (men: 14.9 %) in 2017 (Destatis 2019).

The reasons for old age poverty are manifold. Due to the demographic transition, life expectancies rise and fewer children are born. Therefore, time spend in retirement age lasts longer but fewer people pay into the pension fund, leading to austerity measures and several pension reforms in the last two decades. Additionally, types of employment became increasingly popular that are not subject to pension insurance, such as self-employment or marginal employment, and employment patterns became more discontinuous (regular to precarious employment, employed to self-employed and unemployment) (Bäcker, Schmitz 2013). For women, interruptions due to child-rearing have significant effects on the level of pension after retirement (Breyer, Hupfeld 2009). Unlike other groups affected by poverty, elderly people cannot be expected to leave poverty due to income mobility. With entering retirement, the maximum height of pension payments is already reached and the right to additional future pension payments expires (Goebel, Grabka 2011). In consequence, the pension level is fixed and will only change due to possible pension adjustments. A pensioner's economic situation is determined by household constellations. When the entrance to retirement is characterized by below-average income, there is a great risk that this person will permanently live in old age poverty. Even though employment after retirement is a possibility to alleviate economic deprivation, health problems increase with age and lead to growing health-related expenses on the one hand and prevent physically demanding employment on the other hand (ibid.).

Because poverty can be defined as "the situation in which an individual is unable to participate fully in what is socially accepted as the life of community" (Lyberaki, Tinios 2005: p. 302), financial resources are an important dimension of social exclusion that has been invested many times in previous research. In accordance with the literature (e.g.

[4] The at-risk-poverty rate is defined as the proportion of persons living on less than 60 percent of the median equalized disposable income of the population.

Coleman 1988) it was found that different types of capital are cumulative: The more financial capital, the more social capital (e.g. Erlinghagen Hank 2019; Knack, Keefer 1997).

2.3.2 Social Relations

Drawing on the theoretical work of Coleman and Putnam, social relationships can foster obligations, expectations and trust and can also be used as interpersonal channels of information. They enforce norms, impose sanctions and enable the flow of goods as well as services and hence create resources of different kinds, such as knowledge and skills or physical capital.

Social isolation and loneliness in old age are well known challenges, (western) societies are confronted with as they have not only mental but also physical consequences for the individual and affect an ever-growing share of the population (e.g. Hawkley, Cacioppo 2010; Wenger et al 1996). Low socioeconomic status has been found to be a main factor promoting loneliness as individuals from lower classes generally lack a diverse social network and financial resources to maintain social relationships via visits, collective activities, calls or the internet (Antonucci et al. 1999; Scharf, Gierveld 2008; Hawkley et al. 2008). Research shows that with increasing age people lose connection to established friendship networks and are often incapable to initiate or join new ones (e.g. Licht-Strunk et al. 2005; Alexopoulos 2005; Singh, Misra 2009). Furthermore, variables such as social support and social ties have direct and indirect effects on health and well-being in the last third of life (e.g. Bowen et al. 2013; e.g. Holt-Lundstad et al. 2010). However, these effects vary depending on quantity, quality and type of relationships. Spousal Relationships for example seem to be a unique social context that exerts a far greater effect on old age health than any other relationship.

2.3.3 Civic Participation

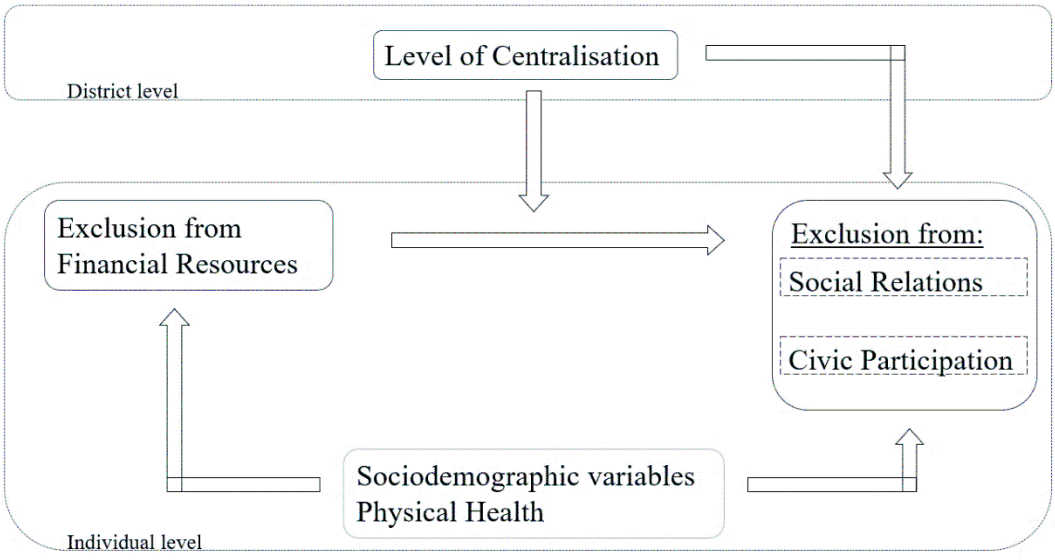
A growing share of people in Germany will enter retirement and leave the labour market for a longer period of time. These people will not participate in society through the life-structuring activity that is gainful employment. However, participation in civic matters has been found to affect the quality of life positively (Siegrist, Wahrendorf 2009) and options to participate are manifold. They range from participation in local politics and voting to newspaper readership and participation in local associations (Putnam 2000). Characteristic for these types of participation is that individuals share (a part of) their resources with others where resources are contributed to the social environment (Bukov et al. 2002). Older adults are connected to their communities by socialising with neighbours, and different religious, charity and organised group associations (Cornwell et al. 2008). Findings show that among elderly people, the oldest are most likely to socialise with neighbours and attend religious or charity events on a weekly basis. According to Wong and Waite, this pattern suggests “that individuals actively cultivate social capital and compensate for changes or losses in their interpersonal social networks by becoming more involved in other social activities.” (Wong, Waite 2016). At the same time, this pattern evokes many questions as individual capacities are declining with increasing age, and the individual could be expected to stay at home more often and withdraw from any high-stimulus and challenging environments and interactions. Therefore, older individuals would be very dependent on a low-barrier environment, short distances and high-quality infrastructure. Research shows that on a spatial level, the distance from older people’s homes to a certain activity and the opportunities for activities nearby are crucial in deciding to exercise an activity (e.g. Oostendrop 2010; Newman 2003). However, Spatial disadvantages can be compensated by subjective motivation and quality of offers, if people are healthy (Oostendrop 2010).

2.4 Current Research and Hypotheses

The United Kingdom has a dominant role in research on social exclusion in old age and is still providing many new and interesting insights on the issue. During the last years, an increasing

number of studies from South America, Australia, Asia and Eastern Europe was published, emphasising the importance of old age social exclusion as a global research topic (Walsh et al. 2016: 93). Though the concept of social exclusion itself has found application in numerous studies, they tend to focus on entire populations (Vrooman, Hoff 2013), younger (migrant) or working adults (Thompson et al. 2014; Bäckman, Nilsson 2011) and individuals with mental health problems (Coombs et al. 2013). Only recently, old age exclusion gained attention, especially regarding its conceptualisation and theoretical development. Though multidimensionality of the concept is acknowledged, the dimensions included in the concept of old age exclusion are not uniformly used in current research. Walsh et al. (2016) identified six dimensions of social exclusion in later life in their recent study in international literature: *Neighbourhood and Community* (objective characteristics, built environment, socio-political structures, crime rates, etc.), *Social Relations* (number and quality of relationships, social support, loneliness and isolation), *Services, Amenities and Mobility* (health care services, transportation, mobility, housing, general services), *Material and Financial Resources* (poverty, income, employment, pension, fuel poverty), *Socio-Cultural Aspects* (ageism, discrimination, symbolic and discourse exclusion) and *Civic Participation* (citizenship, general civic activities, volunteering, community responsibility, voting, political participation). Due to the recent nature of the study, the comprehensiveness of the framework and the renowned reputation of the authors, these six dimensions provide the basis for this study and contribute to the conceptual model that is displayed in Figure 2. As said before, the model is based on social capital theory and both main independent and dependent variables represent different types of capital. The objective of this research is to measure the effect of exclusion from financial resources (economic capital) on exclusion from social relations and civic participation (social capital). These individual-level variables represent three dimensions of old age exclusion (*Material and Financial Resources*, *Social Relations* and *Civic Participation*) and are complemented by a district-level characteristic that indicates objective area attributes. This second-level variable represents another dimension of old age exclusion (*Neighbourhood and Community*) and adds to the multidimensional conceptualisation of exclusion in this study as proposed by Walsh et al (2016). It is expected that district characteristics such as the level of centralisation, availability of public transportation and medical practitioners influence the level of exclusion measured in social relations and civic participation.

Figure 2: Conceptual Model



Source: Own presentation

Current research along this theoretical framework shows support for social capital theory (e.g. Lindström et al. 2002; Cornwell, Laumann 2013; Warner, Adams 2012; Shiovitz-Ezra, Litwin 2012). Different types of capital are cumulative and even within social capital, different types of participation are cumulative. Education and occupational resources positively affect social capital and those who participate in political activities also take part in other types of participation (Bukov et al. 2002). Many scholars have found older people to be especially affected by poverty (e.g. Ogg 2005) and wealthy regions in Britain to be populated by middle-aged population while poorer regions are populated by older people and children (Goldfield 2005). In the early 2000s, Germany seemed to show contrary trends with a decreasing risk-of-poverty rate among older adults (65+; BMAS 2005) and the introduction of social-insurance based long-term care insurance (Hoff 2008). These trends have reversed as was shown in chapter 2.3 due to long-term unemployment and job insecurity among the latest retirement cohorts and several reforms of the pension scheme (ibid.). Lacking financial resources directly influences individuals' abilities to not only use services such as public transportation, medical practitioners or access resources and markets but also private vehicles (fuel poverty, maintenance) or visits to the café, the cinema, theatre or other costly leisure activities that are accessible to others (e.g. Ellwardt et al. 2014). Research also shows that poverty tends to stain close relationships and leads to fewer nonfamily relations. Additionally, researchers found a strong and positive association between civic participation and financial resources (Erlinghagen 2008). Multiple studies emphasize the meaning of accessible resources in social and civic participation (e.g. Hank, Erlinghagen 2010) and show that active elderly people have stronger social contacts and are more likely to also participate in other civic and social associations (Hank, Stuck 2008). Even though there are probably reciprocal reinforcements in resources and social/civic participation, findings show that secured equipment with social, cultural/human and financial capital promotes social and civic participation (Erlinghagen 2008; Nygard, Jakobsson 2013).

Furthermore, studies have focussed on the influence of environmental characteristics on old age exclusion. Studies' main focuses range from characteristics of the immediate residential living environment (Wahl, Oswald 2010), to objective neighbourhood characteristics such as the quality of sidewalks and proximity (Moran et al. 2014) to medical practitioners (Hrast et al. 2013; Parmer et al. 2014; Walsh et al. 2014) as well as macro features, for instance the level of urbanisation of areas (Ogg 2005; Shergold, Parkhurst 2012; Feng et al. 2018) or types of welfare states (Ogg 2005). Many studies also conducted small-scale surveys and qualitative interviews to access circumstances in individual areas that lead to exclusion in peripheral areas in Germany (e.g. Alex 2016; MLUMV 2007). A relatively extensive survey showed that people living in less rural areas are significantly less likely to be excluded from general services, compared to those in more remote rural areas (Shergold, Parkhurst 2012). Other significant factors of exclusion in old age are housing conditions (Morris 2008, Scharf et al. 2005), access to transportation (Walsh et al. 2014) and social cohesion (O'Shea et al 2012). Furthermore, there are multiple, not always consistent findings on regional differences in social relation and civic participation (Erlinghagen, Hank 2019). For Germany, scholars (Erlinghagen 2008; Vogel et al. 2017) found stable East-West differences with higher rates of participation in West Germany. Even though studies included structural-spatial characteristics of the individual's environment in their model (Ogg 2005; Hrast et al. 2013; Erlinghagen 2008) and found significant effects, these associations were rarely tested in a multilevel model to separate individual and objective area characteristics. Studies that used multilevel analyses to assess the influence of environmental characteristics on civic participation and social relations found strong and significant effects for their respective population in China and Sweden (Feng et al. 2018; Lindström et al. 2002).

Because of the recent trends in Germany, that were outlined in chapter 2.2, this study aims at testing the relationship between financial resources and social relations or civic participation as well as the influence of district characteristics such as the level of urbanization on social relations and civic participation as presented in figure 2. Based on the theoretical background outlined in chapter 2.1 as well as the literature review in chapter 2.2 and 2.3, six hypotheses are proposed:

HI: Exclusion from financial resources leads to a higher probability of exclusion from social relations.

HII: Exclusion from financial resources leads to a higher probability of exclusion from civic participation.

HIII: The higher the level of centralisation within a district, the lower the likelihood of exclusion from civic participation among older individuals.

HIV: The higher the level of centralisation within a district, the higher the likelihood of exclusion from social relations among older individuals.

Because environmental factors strongly affect individuals in later life, it is furthermore expected that depending on the level of centralisation the association between exclusion from financial resources and the dependent variables differs. Activities are already limited in peripheral regions and may be even less accessible if means of transportation, participation fees or other expenses cannot be paid for. Central areas on the other hand should provide better connection, more activities and closer proximities.

HV: The effect of exclusion from financial resources on exclusion from civic participation differs by level of centralisation, leading to higher chances of exclusion from civic participation when financially excluded in rather peripheral areas in comparison to rather central areas.

Due to overall stronger and more long-standing social networks in peripheral areas (see chapter 2.2.1), it is expected that exclusion from financial resources will not affect exclusion from social relations as heavily as in more central areas.

HVI: The effect of exclusion from financial resources on exclusion from social relations differs by level of centralisation, leading to lower chances of exclusion from social relations when financially excluded in rather peripheral areas in comparison to rather central areas.

Most studies find years of education, socioeconomic status in general and health to be strong predictors of old age exclusion (e.g. Pampel et al. 2010; Hank, Erlinghagen 2010; Erlinghagen, Hank 2019). Therefore, these variables will be included in the analysis as control variables. For gender, findings differ across countries differ. While in Germany and Sweden men are more likely to participate civically, in the USA, Britain or Japan women tend to be more active (Musick & Wilson 2008). Even though researchers are considering individual and environmental factors of old age exclusion, it is rare to find a study that tested the relationship of individual and environmental factors on different dimensions of exclusion in multilevel analyses (Regenmortel et al. 2016)

3. Empirical Analysis

The empirical analysis is divided into four parts. In the first part, the dataset used in this study is explained and limitations are highlighted (3.1). Then the conceptualisation of the main independent and dependent variables is elaborated on, supplemented by a short description of the control variables in the model (3.2). The third subchapter (3.3) provides an overview of a first descriptive analysis (3.3.1) and the following multilevel analysis (3.3.2). Performing multilevel analyses will help to understand patterns of correlation at the individual as well as at the district level and capture the micro and macro effects on social exclusion simultaneously (e.g. Rabe-Hesketh, Skrondal 2012).

3.1 Data Set

Data analysis in this study is based on data from the German Aging Survey (DEAS). The survey is planned by the German Centre of Gerontology (DZA), funded by the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth (BMFSFJ) and conducted through infas - Institut für angewandte Sozialwissenschaft GmbH. The first wave of the survey took place in 1996, followed by additional waves in 2002, 2008, 2011, 2014 and 2017. The longitudinal and cross-sectional survey is characterised by its representative design and thematic diversity to assess the life situation, attitudes and needs of people aged 40 and over in Germany (Schiel et al. 2015). Initially the panel sample was re-surveyed every six years. Since 2008 the frequency has been changed to every three years. In wave 5 in 2014, both panel participants of past waves and a new basic sample were surveyed. In the basic sample 2014, 6,090 persons born between 1929 and 1974 were interviewed. A total of 4,356 interviews were conducted in the three panel samples that were first surveyed in 1996, 2002 and 2008. Across all cohorts, 10,446 persons took part in the fifth wave of the German Ageing Survey. The survey was carried out by means of computer-assisted personal interviews (CAPI). In addition, a paper questionnaire (so-called drop-off) was used, which had to be completed by the target persons themselves, as in the previous waves (ibid.). The data collection took place between April and November 2014. The interviews were exclusively conducted in German.

For the basic sample 2014, the sample design of the third wave was replicated. Where possible, another sample was drawn from the population registers of the same municipalities as 1996 to 2008 (90 East German, 200 West German municipalities). The sampling was similar to the procedure of the previous waves based on the registers of the residents' registration offices. According to the age range of 40 to 85 years, the birth cohorts 1929 to 1974 were taken into account, in each case according to the proportional distribution in the population. All German and non-German persons born between 1929 and 1974 with their main place of residence in their community were named to the residents' registration offices as a sample total. The offices were asked to draw the addresses. In addition to the address, name, date of birth and citizenship were to be provided. If the year of birth could not be reported, the registration office was asked to communicate at least the age or the assignment to one of the three age groups. For this purpose, the residents' registration offices were given the birth cohorts 1929-44, 1945-59 and 1960-74. The addresses were drawn according to the procedure of a systematic random selection with starting number and interval (Schiel et al. 2015).

After receiving and preparing the address samples from the residents' registration offices, they were checked for overlap with the available panel samples. The comparison of names and addresses between the panel addresses and the new population registration sample revealed an overlap of 473 persons in total, spread over 136 municipalities. These addresses were removed from the address pool prior to drawing the gross-basic sample. On the basis of the prepared addresses, a random selection of the operational addresses was made. A total of

23,984 addresses were used in three tranches (April, August, September 2014). Of the 21,459 respondents in the gross sample who could be interviewed (11% could not be interviewed because they did not meet the required characteristics), 28% could be recruited to participate in the survey. The response rate declined over the years, which is a development consistent with observations in other comparable social science studies. The willingness of the population to take part in surveys has been declining noticeably for several years. However, distribution targets regarding age, gender and region were met (for further information see Schiel et al. 2015).

3.2 Operationalisation

The German Aging Survey offers manifold possibilities regarding multidimensional operationalisations of exclusion as various aspects of the individual's social life are covered in the interview. After reviewing established scholars and their respective operationalisation of Exclusion from social relations and civic participation (Kneale 2012; Lindström et al. 2002; Scharf et al. 2005), two indices of exclusion were constructed.

Following the definition of Scharf et al. 2005, exclusion from social relations draws mainly on social isolation. It represents the "availability and frequency of contacts with family, friends and neighbours" (Scharf et al. 2005: p. 79). Because DEAS data differs from the dataset Scharf and colleagues used, the operationalisation was adapted to the existing variables. If individuals exhibit one of the following characteristics, they were ascribed 1, otherwise they scored 0:

(C1) No living relatives or children OR sees a child or grandchild less than once a week
(C2) No friends in neighbourhood OR has a chat or does something with a friend or acquaintance less than once a week
(C3) Has rare or no contact to neighbours OR scores 3 or higher on 6-item scale for loneliness (De Jong-Gierveld, Van Tilburg 2006)

Table 1 below shows the distribution of exclusion from social relations by each category. Almost 51% of the respondents do not have any living relatives or see their children or grandchildren less than once a week. About 10% have no friends in their neighbourhood or do something with a friend or acquaintance once a week and around 14% have rare to no contact to neighbours or often feel lonely.

Table 1: Exclusion from Social Relations by Category, 65+, final sample

	%	**SD**	**n**
(C1)	0.51	0.506	3,653
(C2)	0.10	0.100	3,653
(C3)	0.14	0.140	3,617

Source: DEAS 2014

The scores for each category were added to an index ranging from 0 to 3, with 3 indicating no exclusion from social relation and 3 indicating a high level of exclusion. This index was dichotomised, with 0 indicating no exclusion and 1 indicating exclusion from social relations. Observations that scored 2 or higher on the exclusion index were coded excluded (1) in the dichotomised variable. This threshold was also proposed by Scharf and colleagues. In order to achieve a large sample size for the newly generated variable, cases were imported into the dichotomised variable as 1, in the event that two out of three categories were marked as 1, even if the third value was missing. This was done because the observations already indicated a high level of exclusion from social relations and including them in the variable despite missing values did not bias the outcome variable. Overall, 16% of the sample population

indicated high levels of exclusion from social relations. The resulting outcome variable reports 3,653 valid observations.

Civic participation was measured by summarizing multiple variables indicating frequency of social and civic participation in specific activities ranging from 1 (Daily) to 6 (Never)[5]. As "Get together with a particular group" can indicate religious or other activities, it can also just imply simple meetings with friends or acquaintances, where individuals participate in social interactions that foster social goods such as gossip and trust. For each activity, a dichotomous variable was generated. When people participated less than 1-3 times per month (5) in a given activity, they scored 1 in the respective variable, otherwise 0. Table 2 shows that nearly 80% of the sample does not participate in cultural events regularly. The same goes for board games (63%), classes and lectures (91%), group gatherings (39%), voluntary work (24%) and political meetings (95%).

Table 2: Exclusion from Civic Participation by Category, 65+, final sample

	%	SD	n
Cultural events	0.78	0.417	3,652
Board games	0.63	0.482	3,653
Classes/Lectures	0.91	0.289	3,652
Get together with a particular group	0.39	0.489	3,653
Voluntary work	0.24	0.429	3,651
Political meetings	0.95	0.211	3,653

Source: DEAS 2014

If an individual scored 1 in all of the activities, the individual was regarded as excluded from civic participation. An indicator variable was created, scoring 1 for excluded individuals and 0 for included individuals. Table 3 shows the share of people excluded from social relations and civic participation. About 15% of the sample are excluded from social relations and around 23% are excluded from civic participation. Because the variable indicating exclusion from social relations was constructed from various variables and valid responses for all of them were required, the number of observations decreased in the process. Overall, valid responses from 3,653 observations could be retrieved from the sample for both outcome variables.

Table 3: Exclusion from Social Relations and Civic Participation, 65+, final sample

	%	SD	n
Exclusion from Social Relation	0.15	0.367	3,653
Exclusion from Civic Participation	0.23	0.424	3,653
Exclusion from Financial Resources	0.18	0.383	3,653

Source: DEAS 2014

The main predictor variable "Exclusion from Financial Resources" (Table 3) was constructed using the perceived financial situation and the official poverty line of less than 60% of median equivalent income of the German population (Destatis 2019b). This line resembles the official at-risk-of-poverty rate and therefore does not measure absolute poverty or wealth but rather a comparison of income to other residents in Germany. When respondents coped barely or not at all with their financial situation, they were marked with 1, as were respondents with an

[5] Full response scale: (1) Daily, (2) Several times a week, (3) Once a week, (4) Between 1-3 times per month, (5) Less often, (6) Never

equivalent income of less than 60% of the median of the population in 2014, otherwise observations were marked with 0[6]. Table 3 shows that 18% of the sample population are excluded from financial resources by this definition. While other studies chose different indicators of financial exclusion, such as the absolute access to material goods (e.g. Townsend 1979) or a line at 40% to 50% of the median equivalent income (Headey et al. 1994), the European Commission frequently uses the at-risk-of-poverty rate as an important indicator in their research and the Europe 2020 headline indicators program (EUROSTAT 2019).

Additionally to these main dependent and independent variables, other characteristics were included in the analysis, such as Gender ([1] female, [0] male), Physical Health[7] ([1] very good – [5] very bad), Level of Education[8] ([1] low – [4] high), Age squared, Existence of a Partner in the Household ([1] yes, [0] no) and Number of People in Household ([1] 1 – [9] 9 and more]). As the relationship between social capital and old age is expected to be nonlinear (see chapter 2 and 3), a squared age term was used in the analysis.

On the district level, one variable was operationalised. The main predictor variable at district level is the level of centralisation. The classification of the spatial location is based on a consideration of the concentration of population and workplaces and the proximity to these places. The proximity to the centres with a wide range of employment opportunities and utilities is decisive for the location and thus also for the competitiveness of regions. Places are not categorized by raster level but through an analysis of the reachable daytime population at the level of districts. The day's population is made up of inhabitants plus in-commuters minus out-commuters. A detailed documentation of the calculation process can be found in BBSR 2012. The mean value and standard deviation of the achievable daily population are used to define four categories: Very Central [1], Central [2], Peripheral [3], Very Peripheral [4].

3.3 Analysis

Due to the variables constructed and used in the models, the sample population decreased from 5,109 respondents above 64 in the 2014 DEAS wave to 3,653 cases that can be used in this analysis. The major factor for missing observations (85%) was missing drop-off questionnaires that included items for the De Jong-Gierveld loneliness scale. Information on income, health and household composition lead to further reduction. The following descriptive analysis is showing first support for the hypotheses proposed in this thesis while the multilevel analysis provides inference-statistical support for some of the hypotheses. The multilevel logistic regression model was fitted using random intercepts and random coefficients.

3.3.1 Descriptive Analysis

A first descriptive analysis was conducted in order to visualise simple distributions across variables and see if the suspected associations show on this level of analysis. Male and female respondents almost evenly participated and showed moderate health and education with an average age of 74 years (Table 4). The mean amount of people living in one household is at almost 2 with 74% of the respondents living with their partners. Around 18% of the sample population is excluded from financial resources, 15% are excluded from social relations and 23% are excluded from civic participation. In very central areas, individuals are less often reporting - compared to the sample average - financial exclusion and exclusion from civic

[6] Full response scale: Do you have enough money to meet your needs? (1) Not at all, (2) Barely, (3) To some extent, (4) More or less, (5) Completely

[7] Self-rated: How would you rate your present state of health? ([1] very good – [5] very bad)

[8] ISCED 0-2 were coded low [1], ISCED 3 was coded medium [2], ISCED 4 sophisticated [3] and ISCED 5-6 high [4].

participation (Appendix 1). Central areas show a relatively average population but less exclusion from civic participation and financial resources. Peripheral areas in the sample are characterised by fewer women and a higher share of people excluded from civic participation and financial resources. Exclusion from both dimensions is highest in this region. Very peripheral regions on the other hand record more women, less exclusion from financial resources and social relations but more often exclusion from civic participation (25%).

Table 4: Distribution Variables among Observations 65+

	M/%	SD	MIN	MAX	n
Gender (%)	0.47	0.500	0	1	3,653
Physical Health	2.60	0.808	1	5	3,653
Education	2.50	0.978	1	4	3,653
Age	74.16	6.015	65	95	3,653
Exclusion from Financial Resources (%)	0.18	0.383	0	1	3,653
Exclusion from Social Relation (%)	0.15	0.321	0	1	3,653
Exclusion from Civic Participation (%)	0.23	0.424	0	1	3,653
Partner in Household (%)	0.74	0.438	0	1	3,653
Household Size	1.84	0.675	1	9	3,653

Source: DEAS 2014

These patterns, as documented in Appendix 1, support the hypothesis that exclusion from civic participation increases with periphery. Furthermore, exclusion from social relations seems to decline with increasing periphery. Exclusion from financial resources indicates a reverse-u shape with highest shares of exclusion in less central and less peripheral areas. Moreover, table 5 indicates that if people are excluded from financial resources, they are also more often excluded from social relation and especially civic participation. Additionally, standard deviations are larger among financially excluded individuals than among financially non-excluded individuals. These preliminary findings support the hypothesis that exclusion from financial resources also affects exclusion from social relations and civic participation among people aged 65 and above. Exclusion from financial resources is highest in peripheral regions and following the hypothesis that more financial exclusion leads to a higher likelihood of exclusion from social relations and civic participation, one would also expect higher rates of exclusion from social capital in these regions. However, this is not the case: Exlusion from civic participation is highest in very peripheral areas while exclusion from social relations is highest in very central and central areas.

Table 5: Outcome Variables by Predictor Variable, 65+

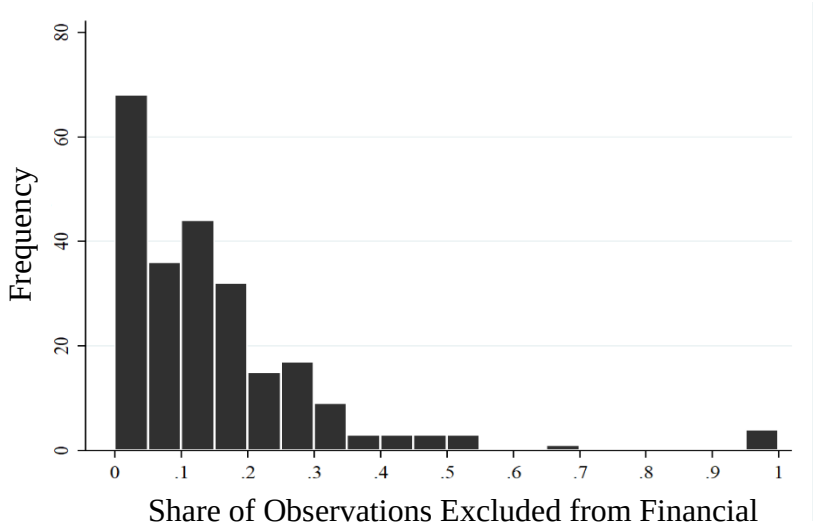
	%	SD	n
Not Excluded from Financial Resources			
Exclusion from Social Relation	0.12	0.322	3,119
Exclusion from Civic Participation	0.20	0.397	3,119
Excluded from Financial Resources			
Exclusion from Social Relation	0.26	0.439	534
Exclusion from Civic Participation	0.34	0.474	534

Source: DEAS 2014

Furthermore, it is important to notice the large amount of between-district variation in the mean of "Exclusion from Financial Resources". Figure 3 shows the frequency of districts by share of observations excluded from financial resources. Almost one third of all 238 districts in the sample indicate a share of exclusion from financial resources below 5% and more than three quarters indicate a share smaller than or equal to 20%. 58 districts report a share of exclusion higher than 20% and four districts even show 100% of their sample population excluded. Only one out of these four districts is located in East Germany.

These analyses are however descriptive and do not allow for generalised assessments on the state of exclusion in Germany. Further investigations are needed in order to determine the significance and size of the effect of centralisation on dimensions of exclusion. Before estimating inference statistical models, assumptions of logistic regression models are checked. Multicollinearity is not present as no correlation is not too high (Appendix 1). The highest significant (at least $p<0.05$) correlation between the independent variables is 0.56 for "Number of People in a Household" and the indicator "Partner in Household", followed by "Partner in Household" and "Gender" (-0.29) as well as "Education" and "Gender" (-0.29). Many variables record significant correlations between 0.10 and 0.25. Additionally, assumptions of a large sample size and appropriate outcome structure (binary) are met. As cross-sectional data are used, observations should be independent of each other when clustering in areas is accounted for.

Figure 3: Frequency of Districts by Share of Observations Excluded from Financial Resources



Source: DEAS 2014, own presentation

3.3.2 Multilevel Logistic Regression

After only including valid responses in the sample population, the data set now consists of 3,653 observations (*i*) in 258 German districts (*j*)[9]. In a generalized linear random intercept model and using logit link function, the equation the model is based upon becomes:

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_1 x_{ij} + u_j \qquad (1.0)$$

[9] The analysis was carried out with the help of documents from the Centre for Multilevel Modelling of Bristol University (Steele 2009; Leckie 2010).

Eight models are fitted for each of the dependent variables (Table 8): An empty model (M1), a model only including the main independent variable (M2), a model including all covariates (M3), a model including only the main independent variable and its random slope (M4), a model including only the main independent variable and its slope as well as the context variable and its interaction with the main independent variable (M5), a model containing all covariates and the main predictor's random slope (M6), a model containing all covariates and the context variable (M7) and a model containing all covariates and context variables as well as an interaction term between context variable and main predictor (M8). The number of iterations used varied by model, however attention was always given to the choice of an appropriate number of iteration processes with regard to the accuracy of the estimation and the duration of the calculation. In the empty model (2.0), the intercept $\beta_0$is shared by all districts while the random effect $u_{0_j}$is specific to district *j*. Furthermore, it is assumed that the random effect follows a normal distribution with variance σ^2_{u0}.

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + u_{0_j} \qquad (2.0)$$

3.3.2.1 Exclusion from Civic Participation

The results from fitting a multilevel logit model for the probability of being excluded from civic participation with district random effects but no explanatory variables are presented in Table 6 below. Using maximum likelihood estimation, the odds of being excluded from civic participation in an 'average' district (with $u_j = 0$) are estimated as exp(-1.353) = 0.26, and the corresponding probability is 0.26/(1+0.26) = 0.21 which coincides with the descriptive findings. The between-district variance in the log-odds of being excluded from civic participation is estimated as 0.189 with a standard error of 0.054. In order to test the significance of between-district variance, a likelihood ratio test was utilized. The test statistic for civic participation is 32.08, giving $p < 0.001$ and suggesting that a multilevel model is required in order to fit the data. Even when halved in order to account for the one-sided alternative hypothesis ($\sigma_u^2 > 0$) as variances are by definition non-negative, the statistic is still highly significant.

Table 6: Empty Multilevel Logit Model Civic Participation, with district effects

Parameter	Estimate	SE
β_0 (Constant)	-1.353***	0.056
σ_u^2 (Between-District Variance)	0.189***	0.054

Source: DEAS 2014

Because it is difficult to assess the size of the district effect when looking at the log-odds of being excluded from civic participation, the estimates are converted to predicted probabilities. Under the assumption that u_j is normally distributed, 95% of the districts would have a value of u_j within 2 standard deviations from the mean of zero, i.e. $-2\hat{\sigma}_u = -2\sqrt{0.189} = -0.869$ and +0.869. Using the following equations,

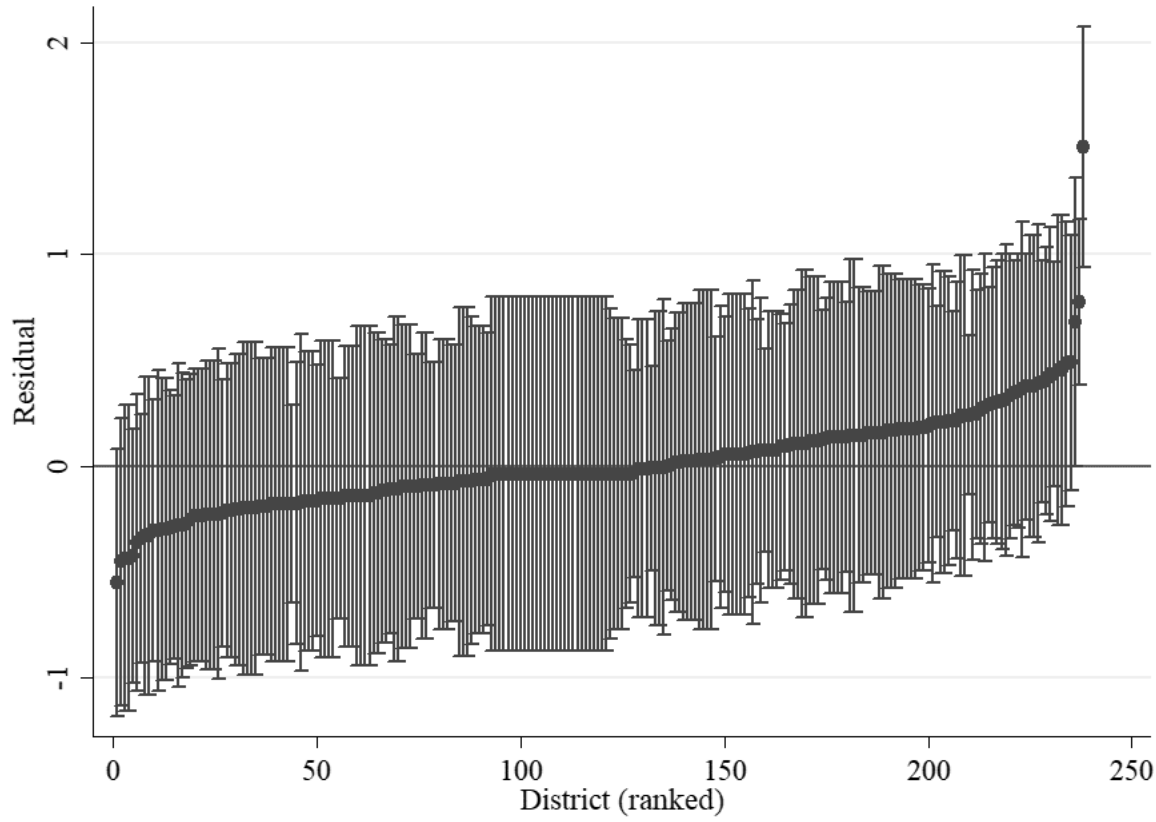
$$\hat{\pi} = \frac{\exp(-1.353-0.869)}{1+\exp(-1.353-0.869)} = 0.10 \qquad (3.0)$$

and

$$\hat{\pi} = \frac{\exp(-1.353+0.869)}{1+\exp(-1.353+0.869)} = 0.38 \qquad (4.0)$$

it can be expected that the proportion excluded from civic participation lies between 0.10 and 0.38 in the middle 95% of districts. When looking at the caterpillar plot (Figure 4) obtained from the empty model, the small size of observations per district becomes visible in form of large confidence intervals. District log-odds of being excluded from civic participation are assumed to differ significantly from the overall district average, if their confidence interval does not overlap the line at zero (mean log-odds of being excluded from civic participation across all districts). Due to a very small sample size per district, all but two districts cross the zero-line. Because district identifications are randomized due to data anonymity, it is not possible to retrace the district ids to their names. However, individual district means do differ a lot from the overall district mean.

Figure 4: Caterpillar Plot Showing District Residuals with 95% Confidence Intervals for Log-Odds of Being Excluded from Civic Participation



Source: DEAS 2014, own presentation

Using the following equation, the main predictor was included into the model:

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_{Ex(FR)}x_{Ex(FR)j} + u_j \qquad (5.0)$$

When adding the main predictor variable "Exclusion from Financial Resources" to the model (M2), the following estimates are obtained (Table 7). If individuals are not excluded from financial resources, the estimated log-odds of being excluded from civic participation in an 'average' district are -1.464. Controlling for district differences, it can be expected that if people are excluded from financial resources, the odds to be excluded from civic participation increase by a factor of exp(0.697) = 2.01. If people are excluded from financial resources,

they are twice as likely as their richer peers to be also excluded from civic participation. These coefficients are highly significant.

Table 7: Multilevel Logit Model Civic Participation, with district effects (M2)

Parameter	Estimate	SE
β_0 (Constant)	-10.464***	0.058
β_1 (Exclusion [FR])	0.697***	0.106
σ_u^2 (Between-District Variance)	0.158***	0.050

Source: DEAS 2014

Figure 5 (M2) illustrates these findings by showing the predicted log-odds of being excluded from civic participation by exclusion from financial resources. Note that for the random intercept model, the lines are parallel because it is assumed that the effect of exclusion from financial resources is the same for each district. If people are excluded from financial resources, the log-odds of being excluded from civic participation range from -1.25 to 0.54. This translates to a range in probabilities of exp(-1.25)/[1+exp(-1.25)] = 0.22 to exp(0.54)/[1+exp(0.54)] = 0.63. If no exclusion from financial resources is indicated, exclusion from civic participation ranges from probabilities of 0.12 to 0.46. The level of exclusion from civic participation therefore varies heavily between districts, indicating strong district effects.

In a next step, a random coefficient for "Exclusion from Financial Resources" is added to the model:

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_{Ex(FR)}x_{Ex(FR)j} + u_j + u_{1j}x_{Ex(FR)j} \qquad (6.0)$$

Now the assumption that the effect of exclusion from financial resources is the same for every district is relaxed. With this step we further investigate between-district differences. The output of the regression is depicted in Figure 5 (M4). The intercept variance of -1.465 is the between-district variance in the log-odds of being excluded from civic participation if people are not excluded from financial resources, while 0.542 is the between-district variance in the effect of exclusion from financial resources.

Table 8: Multilevel Logit Model Civic Participation, with district effects and random coefficients (M4)

Parameter	Estimate	SE
β_0 (Constant)	-1.465***	0.061
β_1 (Exclusion [FR])	0.607***	0.137
σ_{u0}^2 (Intercept Variance)	0.196	0.069
σ_{u1}^2 (Coefficient Variance)	0.542***	0.248
σ_{u01} (Intercept-Coefficient Covariance)	-0.151	0.101

Source: DEAS 2014

A likelihood-ratio test was utilized to assess the significance of the effect of exclusion from financial resources across districts. The null hypothesis states that σ^2_{u1} and σ^2_{u01} are simultaneously equal to zero. With LR = 12, the test statistic is significant, indicating that the effect of exclusion from financial resources indeed varies across districts. However, if all covariates are considered in the model, including level of centralisation, the effect turns insignificant (Table 9).

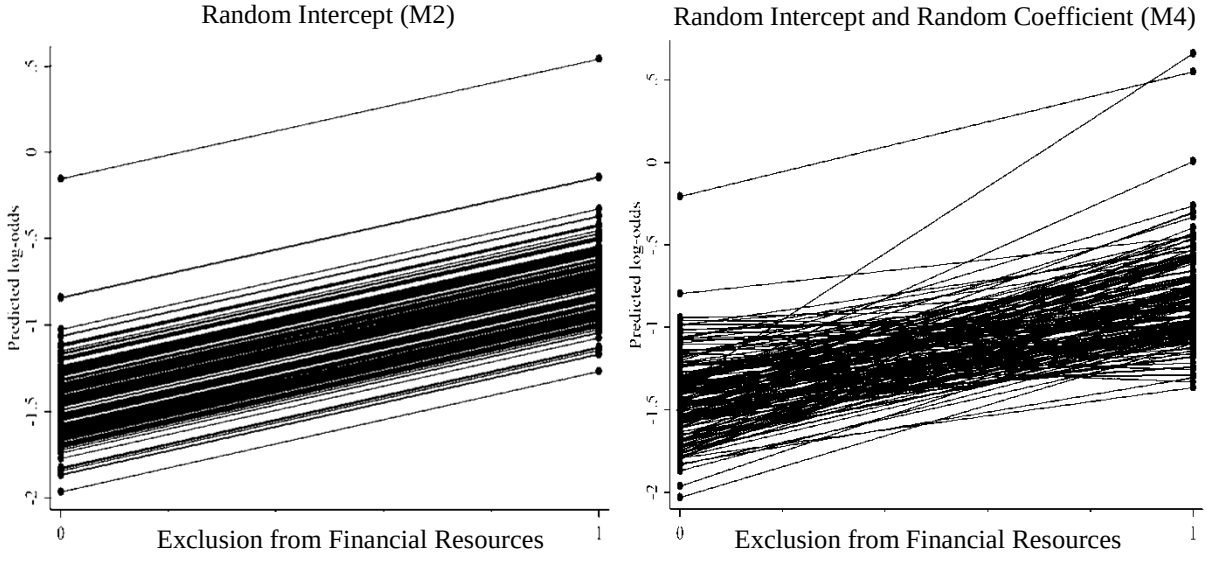
Table 9: Likelihood Ratio Test for Significant Random Effects (Civic Participation)

		Likelihood-Ratio Test Result (Prob > Chi²)
Civic Participation	M4 vs. M2	0.0025
	M7 vs. M7.1	0.0911

Source: DEAS 2014

To illustrate the relationship, predicted log odds are displayed for model 4 in Figure 5. For district *j*, the effect of being excluded from financial resources compared to being not excluded from financial resources on the log-odds of being excluded from civic participation is estimated at $0.607 + \hat{u}_{1j}$. It is now very visible that the effect of exclusion from financial resources varies across districts. Though most districts have positive coefficients, they vary strongly in their size. However, predicted probabilities do not change a lot. If no exclusion from financial resources is indicated, exclusion from civic participation ranges from probabilities of 0.12 to 0.45. If people are excluded from financial resources, probabilities of being excluded from civic participation range from 0.20 to 0.66. Due to the negative covariance, a pattern of fanning in is visible. Calculating the Interclass Correlation Coefficient or Variance Partition Coefficient (ICC/VPC), rho is indicating that in both models (M2, M4) around 5% of the residual variation in the likelihood to be excluded from civic participation is attributable to unobserved community characteristics.

Figure 5: Predicted District Lines for the Relationship between Exclusion from Financial Resources and Exclusion from Civic Participation (M2, M4)



Source: DEAS 2014, own presentation

Substituting the general terms in the formula for between-group variance in a random coefficient model

$$var\left(u_{0j} + u_{1j}Ex(FR)_{ij}\right) = \sigma_{u0}^2 + 2\sigma_{u01}Ex(FR)_{ij} + \sigma_{u1}^2 Ex(FR)_{ij}^2$$

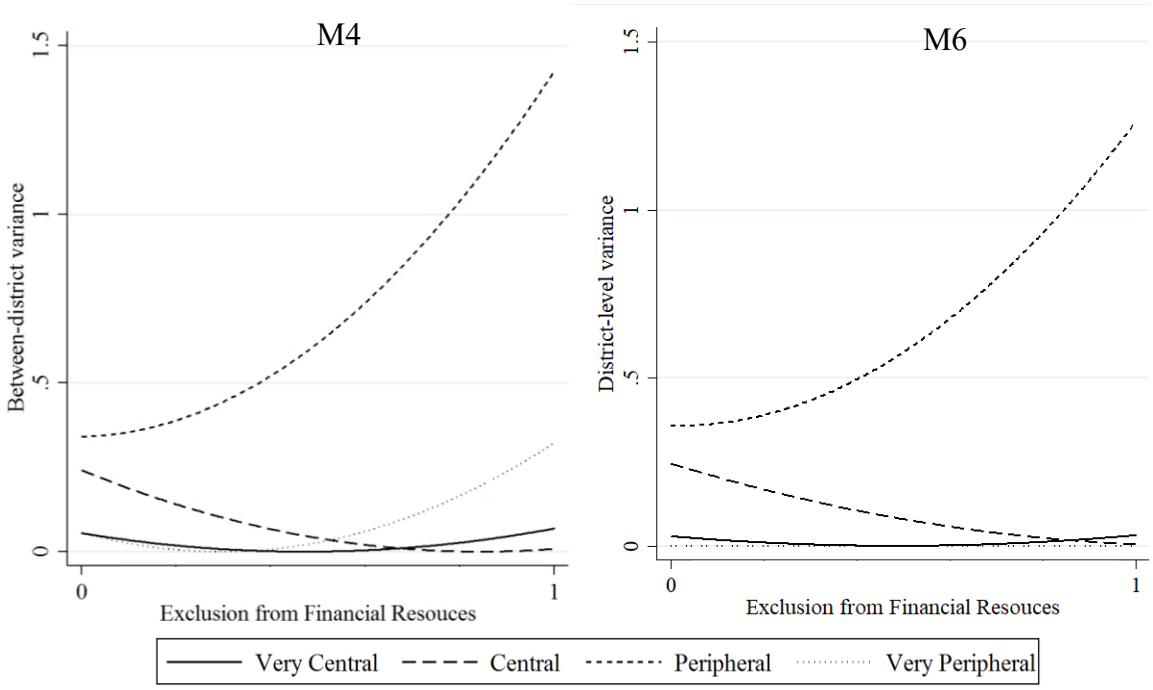
$$= 0.196 - 0.302x + 0.542x^2 \qquad (7.0)$$

= 0.196 in financially non-excluded cases (x=0) and

= 0.187 in financially excluded cases (x=1)

district-level variance is estimated by exclusion from financial resources as estimated in M4. The numbers indicate that between-district differences in the probability of being excluded from civic participation are less pronounced among financially excluded than non-excluded individuals. When controlling for all covariates (M7), between-district differences increase to 0.432 for financially excluded and decrease to 0.141 for financially non-excluded individuals. Results from model 7 support the expectation that the effect of financial exclusion on exclusion from civic participation varies by district.

Figure 6: Between-District Variance in Log-Odds of Being Excluded From Civic Participation as a Function Of Exclusion from Social Relations by Level Of Centralisation



Source: DEAS 2014, own presentation

When analysing the between-district variance by level of centralisation and as a function of exclusion from financial resources (Figure 6, M4)[10], we find that when individuals are not excluded from financial resources, exclusion from civic participation is about equal in very

[10] Note that the slopes in figure 6 cannot be interpreted, as "Exclusion from Financial Resources" cannot take values other than 0 and 1. However, the start and end points of the slopes at 0 and 1 can be interpreted and visualise the changes in the coefficients powerfully. Additionally, the number of observations for peripheral and very peripheral districts is relatively small, leading to overall insignificant regression models.

peripheral and very central areas in Germany. When financially excluded, we see that between-district variances increase much stronger and sharper for very peripheral regions than very central regions. However, the effect of financial exclusion on between-district variance is remarkably stronger in peripheral areas and even inverse in central areas. While between-district variance among financially non-excluded individuals is already higher in peripheral regions than in all other regions, between-district variance triples for financially excluded individuals. In central areas, between-district variance in the log-odds of being excluded from civic participation is higher for non-excluded individuals than for excluded individuals. In order to control for confounding variables of exclusion from financial resources and civic participation, the individual-level covariates (chapter 3.2) are added to the model (M6). When looking at the between-district variances in exclusion from civic participation when controlled for important covariates, variance in log-odds of being excluded from civic participation decreases for financially excluded individuals in very peripheral areas compared to M4. Variances in peripheral and central areas do not change strongly.

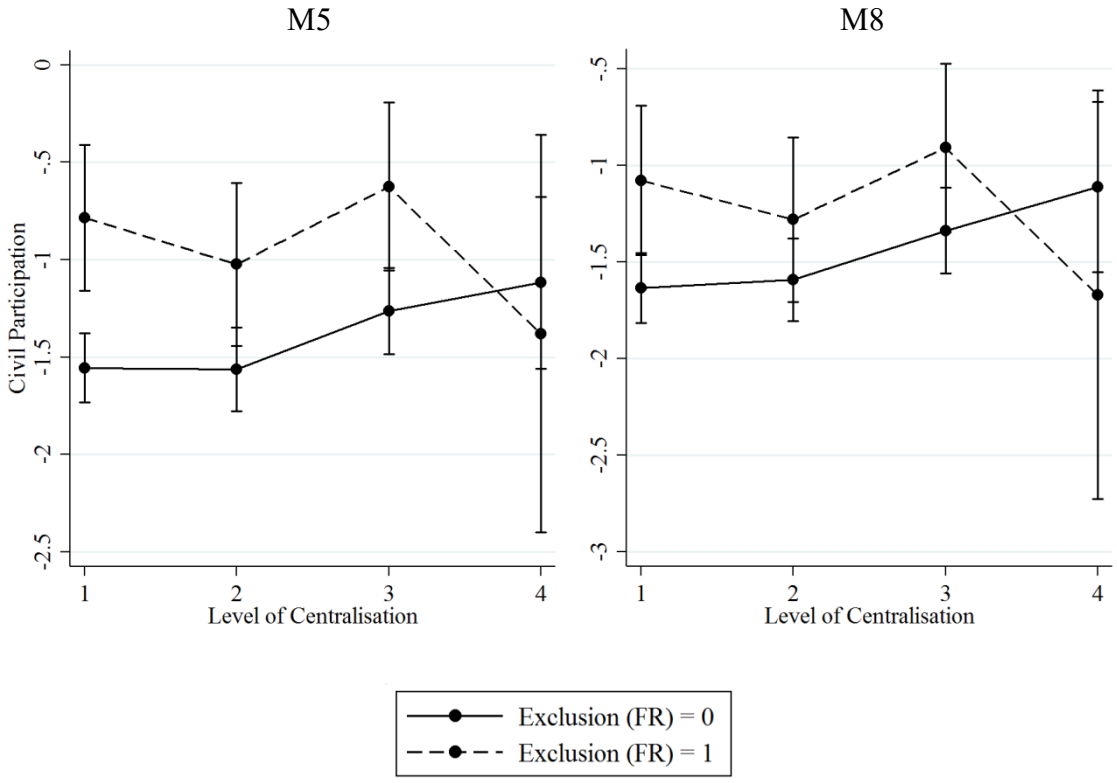
Tables 10 and 11 show all of the computed models for the dependent variable "Exclusion from Civic Participation". The effect of "Exclusion from Financial Resources" on "Exclusion from Civic Participation" decreases when controlling for "Exclusion from Social Relations", level of education, physical health, age and level of centralisation but remains significant (M2 vs. M3; M5 vs. M7). When including interaction effects between "Exclusion from Financial Resources" and level of centralisation (M8), the effect of "Exclusion from Financial Resources" increases again compared to M6 and M7. The strong effect of peripheral regions on the outcome variable as indicated by figure 7 is the only significant category of the context variable in models 6 and 7. Conditional on including all covariates and the interaction term, additionally the category "very peripheral" shows significance in explaining the outcome variable (M8). Across all models, the strongest predictor of "Exclusion from Financial Resources" is the level of education. When looking at the odds-ratios and holding all other variables constant, individuals are 2.5 times more likely to be excluded if they are low educated compared to high educated (1/0.398= 2.51) and almost 2 times more likely to be excluded (1/0.520=1.92) than individuals indicating sophisticated levels of education. Also exerting a strong effect at high significance across all models, "Exclusion from Social Relations" validates the strong association between different dimensions of social exclusion. "Exclusion from Financial Resources" is additionally significant across waves and indicates an around 2.31 higher chance of "Exclusion from Civic Participation" for individuals that are also excluded from social relations if all other variables remain constant. The remaining covariates indicate higher chances of "Exclusion from Civic Participation" for people with worse health and rather male than female individuals.

Looking at Figure 7, we see the interaction effect between "Exclusion from Financial Resources" and level of centralisation on "Exclusion from Civic Participation". As discussed before, the 95%-confidence-intervals overlap, validating the non-significance of the interaction effects documented in table 10. In comparison, including important covariates into the model (M8) leads to smaller differences in "Exclusion from Civic Participation" between excluded and non-excluded individuals in very central [1], central [2] and peripheral areas [3] and larger differences in very peripheral areas. Large standard errors especially for very peripheral [4] areas are again due to a small number of observations in the sample. However, interaction effects are suggested when lines are not parallel, leaving interesting indications for very central and very peripheral areas, as especially the latter indicates lower levels of

"Exclusion from Civic Participation" for excluded individuals than for non-excluded individuals. Predicted log-odds of "Exclusion from Civic Participation" for financially non-excluded observations are increasing with decreasing centrality while for financially excluded individuals, predicted log-odds of "Exclusion from Civic Participation" are decreasing with decreasing centrality.

Across all models (M1-M8), the proportion of the total residual variance in the propensity to be excluded from civic participation that is due to differences between districts is estimated between 4% (M8) and 6% (M4). The between-district variance from each model's constant differs significantly in each of the estimated models between 0.196 (M4) and 0.138 (M8). District-variance in coefficients of "Exclusion from Financial Resources" differs between models from 0.542 (M4) to 0.312 (M8), indicating that some of the variance in coefficients is explained by the covariates. Controlling for random coefficients of "Exclusion from Financial Resources" decreases the coefficient of "Exclusion from Financial Resources" on "Exclusion from Civic Participation" (M2 vs. M4; M3 vs. M6). The negative covariance between intercepts and coefficients suggests that districts with a high positive intercept tend to have a strong negative coefficient (strong negative association between "Exclusion from Financial Resources" and "Exclusion from Civic Participation").

Figure 7: Adjusted Predictions of Exclusion from Civic Participation by Level of Centralisation and Exclusion from Financial Resources



Source: DEAS 2014, own presentation

Table 10: All Multilevel Logistic Regression Models (M1 – M8) Exclusion from Civic Participation (log-odds)

Multilevel Logistic Regression (CP) Fixed Part (Part I)

	M1	M2	M3	M4	M5	M6	M7	M8
Exclusion (FR)		0.697***	0.459***	0.607***	0.771***	0.394**	0.381**	0.556**
		(0.106)	(0.116)	(0.136)	(0.210)	(0.140)	(0.140)	(0.211)
Exclusion (SR)			0.838***			0.829***	0.835***	0.840***
			(0.114)			(0.116)	(0.115)	(0.115)
Gender(female)			-0.255**			-0.255**	-0.253**	-0.256**
			(0.0941)			(0.0950)	(0.0949)	(0.0949)
Physical Health (good-bad)			0.312***			0.314***	0.311***	0.312***
			(0.0534)			(0.0540)	(0.0540)	(0.0539)
Age²			0.000298***			0.000297***	0.000296***	0.000295***
			(0.0000491)			(0.0000496)	(0.0000496)	(0.0000496)
Partner HH (yes)			0.163			0.179	0.169	0.173
			(0.132)			(0.135)	(0.135)	(0.135)
Size HH			-0.0548			-0.0622	-0.0586	-0.0619
			(0.0893)			(0.0918)	(0.0917)	(0.0920)
Edu =medium			-0.256			-0.266	-0.269	-0.267
(ref.: low)			(0.143)			(0.145)	(0.145)	(0.145)
Edu =soph.			-0.653***			-0.658***	-0.666***	-0.666***
			(0.179)			(0.181)	(0.181)	(0.181)
Edu =high			-0.920***			-0.927***	-0.926***	-0.922***
			(0.172)			(0.174)	(0.174)	(0.174)
Level of Centralisation (ref.: Very Central)								
Central					-0.007		0.000568	0.0426
					(0.140)		(0.129)	(0.140)
Peripheral					0.291*		0.276*	0.296*
					(0.143)		(0.131)	(0.143)
Very Peripheral					0.437		0.352	0.524*
					(0.242)		(0.230)	(0.241)
Interaction								
Central					-0.233			-0.244
#FR(1)					(0.313)			(0.309)
Peripheral					-0.132			-0.127
#FR(1)					(0.314)			(0.310)
Very Peripheral					-1.032			-1.115
#FR(1)					(0.599)			(0.607)
Constant	-1.353***	-1.464***	-3.521***	-1.465***	-1.555***	-3.515***	-3.580***	-3.601***
	(0.0557)	(0.0576)	(0.397)	(0.0605)	(0.0906)	(0.403)	(0.408)	(0.408)

Source: DEAS 2014

Table 11: All Multilevel Logistic Regression Models (M1 – M8) Exclusion from Civic Participation (log-odds) (continued)

Multilevel Logistic Regression (CP) Random Part (Part I)

	M1	M2	M3	M4	M5	M6	M7	M8
Var(_cons)	0.189*** (0.054)	0.158*** (0.050)	0.153*** (00.052)	0.196*** (0.068)	0.162*** (0.065)	0.174*** (0.067)	0.142*** (0.064)	0.138*** (0.063)
var(financ~d)				0.542 (0.248)	0.488 (0.235)	0.375 (0.233)	0.354 (0.228)	0.312 (0.218)
cov(financ~d,_cons)				-0.151 (0.105)	-0.139 (0.095)	-0.099 (0.098)	-0.083 (0.095)	-0.079 (0.092)
Observations	3653	3653	3653	3653	3653	3653	3653	3653

Standard errors in parentheses
Source: DEAS 2014
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: DEAS 2014

3.3.2.2 "Exclusion from Social Relations"

The same calculations and estimations were prepared for the second dependent variable, "Exclusion from Social Relations". The results from fitting an empty multilevel logit model for the probability of being excluded from social relations with district random effects are presented in Table 12. Using again maximum likelihood estimation, the odds of being excluded from social relations in an 'average' district are estimated at 0.15 with the corresponding probability of 0.13, which was already indicated by the descriptive findings. The between-district variance in the log-odds of being excluded from social relations is estimated at 0.124 with a standard error of 0.054. The utilized LR test (LR = 12.53) indicates that variance in "Exclusion from Social Relations" differs significantly across districts ($p < 0.001$), though not unambiguously when halved.

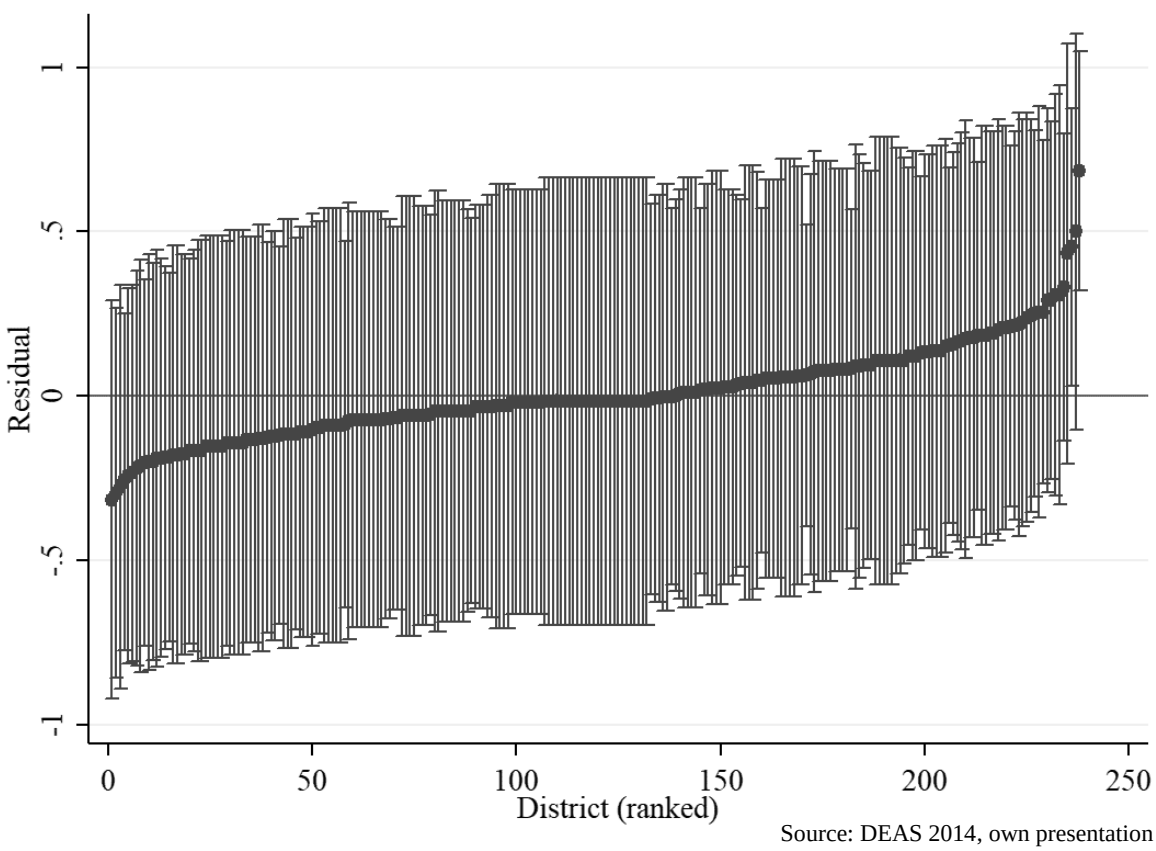
Table 12: Multilevel Logit Model Social Relations, with district effects (M2)

Parameter	Estimate	SE
β_0 (Constant)	-1.904***	0.061
σ_u^2 (Between-District Variance)	0.124***	0.054

Source: DEAS 2014

The predicted probabilities estimated by using the adapted equations 3.0 and 4.0, range from 0.06 to 0.26. It can be expected that the proportion excluded from social relations lies between 6% and 26% in the middle 95% of districts. Figure 8 shows the caterpillar plot obtained from the empty model. Again, the very large confidence intervals do overlap with the mean log-

Figure 8:Caterpillar Plot showing District Residuals with 95% Confidence Intervals for Log-Odds of Being Excluded from Social Relations



Source: DEAS 2014, own presentation

odds of being excluded from social participation in districts, indicating that district log-odds of being excluded from social relations do not differ significantly from the overall district average. However, individual district means do differ a lot from the overall district mean.

When adding the main predictor variable "Exclusion from Financial Resources" to the model (M2), the following estimates are obtained (Table 13). If individuals are not excluded from financial resources, the estimated log-odds of being excluded from social relations in an 'average' district are -2.093. Controlling for district differences, it can be expected that if people are excluded from financial resources, the odds to be excluded from civic participation increase by a factor of exp(0. 984) = 2.68. If people are excluded from financial resources, they are twice as likely as their richer peers to be also excluded from social relations. These coefficients are highly significant.

Table 13: Multilevel Logit Model Social Relations, with district effects (M2)

Parameter	Estimate	SE
β_0 (Constant)	-2.093***	0.058
β_1 (Exclusion [FR])	0.984***	0.106
σ_u^2 (Between-District Variance)	0.122***	0.050

Source: DEAS 2014

Figure 9 illustrates these findings again by showing the predicted log-odds of being excluded from social relations by "Exclusion from Financial Resources". M2 shows the predicted log-odds for the random-intercept model (Table 13) while M4 shows the predicted coefficients for the random-intercept and random-coefficient model (Table 14). If people are excluded from financial resources, the log-odds of being excluded from civic participation range from -1.42 to -0.37, leading to predicted probabilities ranging from 0.20 to 0.41, depending on the district the observations are clustered in. The results from the equation (adapted from equation 6.0) including random coefficients are presented in Table 14.

Table 14: Multilevel Logit Model Social Relations, with district effects and random coefficients (M4)

Parameter	Estimate	SE
β_0 (Constant)	-2.085***	0.069
β_1 (Exclusion [FR])	0.812***	0.164
σ_{u0}^2 (Intercept Variance)	0.118	0.061
σ_{u1}^2 (Coefficient Variance)	0.742***	0.384
σ_{u01} (Intercept-Coefficient Covariance)	-0.054	0.115

Source: DEAS 2014

With LR = 10.03, the test statistic is significant in case of M4, indicating that the effect of "Exclusion from Financial Resources" indeed varies across districts (Table 15). If, however, all covariates are considered in the model again including level of centralisation, the effect becomes insignificant.

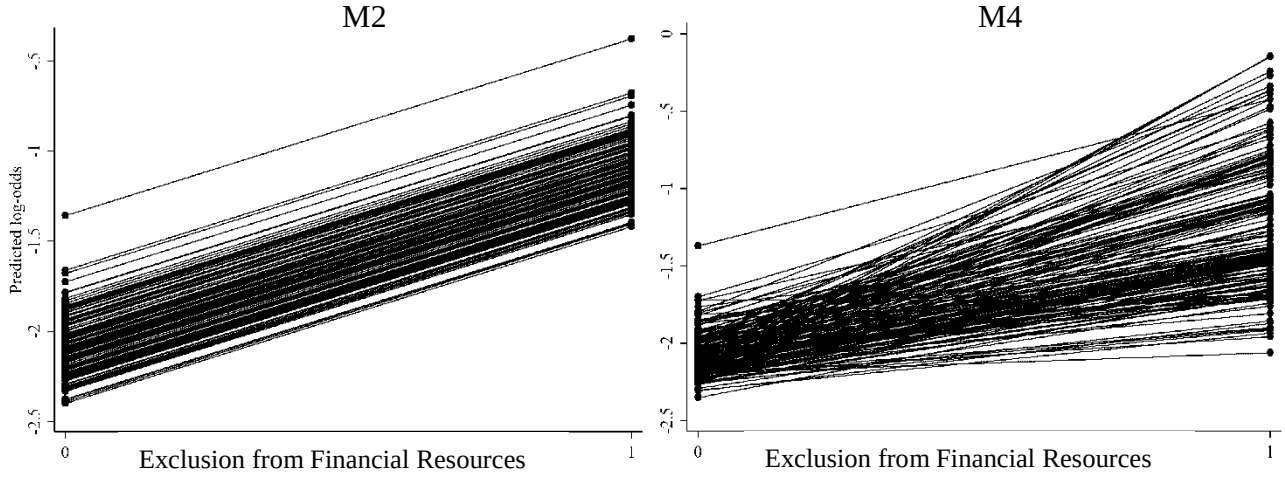
Table 15: Likelihood Ratio Test for Significant Random Effects (Social Relations)

		Likelihood-Ratio Test Result (Prob > Chi²)
Social Relations	M4 vs. M2	0.0066
	M7 vs. M7.1	0.3325

Source: DEAS 2014

To illustrate the relationship, predicted log odds of the simple models with (M2) and without random coefficients (M4) are displayed in Figure 9. For district *j*, the effect of being excluded from financial resources compared to being not excluded from financial resources on the log-odds of being excluded from social relations is estimated at 0.812 + $\hat{u}_{1j}$. The small negative covariance, together with the strong positive estimate for β_1 leads to the 'fanning out' pattern in the prediction lines. Overall, Figure 9 suggests that the effect of "Exclusion from Financial Resources" on "Exclusion from Social Relations" varies across districts. If excluded from financial resources, predicted probabilities of being excluded from social relations vary between 11% and 46% in M4. However, if people are not excluded from financial resources, predicted probabilities only range from 9% to 20%. The range of predicted probabilities therefore increases when coefficients of "Exclusion from Financial Resources" are allowed to vary between districts. The ICC for both models (M2, M4) is estimated around 0.035, indicating a lower share of residual variation that is attributable to unobserved community characteristics, compared to residual variation in civic participation.

Figure 9: Predicted District Lines for the Relationship between Exclusion from Financial Resources and Exclusion from Social Relations (M2, M4)



Source: DEAS 2014, own presentation

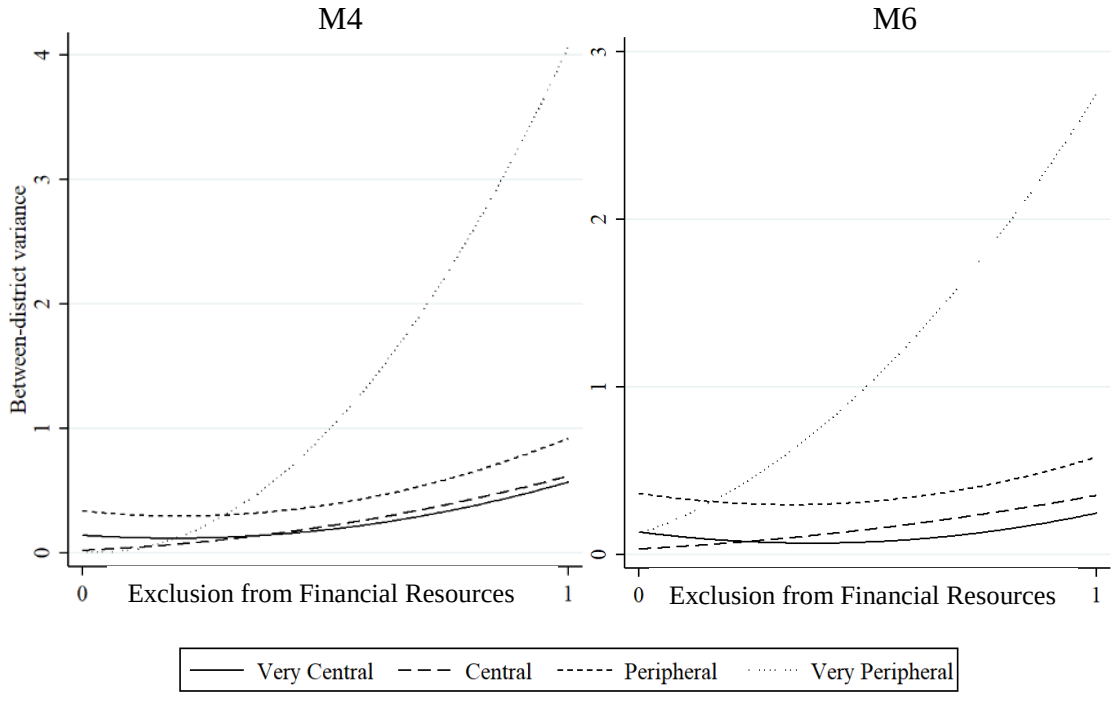
When analysing the between-district variance by level of centralisation and as a function of "Exclusion from Financial Resources" (Figure 10, M4)[11], we find that when individuals are not excluded from financial resources, "Exclusion from Social Relations" is about equal and very low in very peripheral and central areas in Germany, while higher in very central and peripheral areas. The coefficient for "Exclusion from Financial Resources" in very peripheral

[11] Note that the slopes in figure 10 cannot be interpreted, as "Exclusion from financial resources" cannot take values other than 0 and 1. However, the start and end points of the slopes at 0 and 1 can be interpreted and visualise the changes in the coefficients powerfully.

areas is much stronger and higher than in all other areas, leading to a much higher between-district variance in these areas.
In order to control for confounding variables of "Exclusion from Financial Resources" and social relations, the individual-level covariates are added to the model (M6). When looking at the between-district variances in "Exclusion from Social Relations" when controlled for important covariates, variance in log-odds of being excluded from social relations decreases for financially excluded individuals in very peripheral areas and the coefficient is not as strong anymore, compared to M4. Additionally, between-district variance increases in very peripheral areas for non-excluded individuals.

Tables 16 and 17 show all of the computed models for the dependent variable "Exclusion from Social Relations". If no covariates are controlled for, financially excluded individuals are exp(0.984)= 2.7 times more likely to be excluded from social relations than their financially non-excluded peers (M2). This effect decreases when additional covariates are taken into the model (M3, M6, M7) to 1.6 odds in the complete model (M8). While "Exclusion from Financial Resources" is a strong and significant predictor in all other models, it is insignificant in M8 ($p = 0.066$). "Exclusion from Civic Participation" remains a strong and significant predictor of "Exclusion from Social Relations" across all models with a standardised coefficient even stronger than "Exclusion from Financial Resources", when controlled for (2.25 vs 2.03 in M3; 2.24 vs. 1.89 in M7). Additionally, the level of centralisation does not affect "Exclusion from Social Relations" significantly. Contrary to the models on "Exclusion from Civic Participation", gender and education do not explain variance in the depended variable significantly, while besides physical health, also age, having a partner in the household and size of the household do have strong effects across all models.

Figure 10: Between-District Variance in Log-Odds of Being Excluded from Civic Participation as a Function of Exclusion from Social Relations by Level of Centralisation



Source: DEAS 2014, own presentation

Across all models (M1-M8), the proportion of the total residual variance in the propensity to be excluded from social relations that is due to differences between districts is estimated between 3% (M8) and 4% (M1). The between-district variance differs significantly in each of the estimated models between 0.127 (M3) and 0.108 (M5). Controlling for random slopes decreases the coefficient of “Exclusion from Financial Resources” on “Exclusion from Social Relations” (M2 vs. M4; M3 vs. M6). District-variance in coefficients of “Exclusion from Financial Resources” differs strongly between models from 0.741 (M4) to 0.356 (M8), indicating that some of the variance in coefficients is explained by the covariates.

Table 16: All Multilevel Logistic Regression Models (M1 – M8) Exclusion from Social Relations (log-odds)

	M1	M2	M3	M4	M5	M6	M7	M8
Exclusion (FR)		0.984***	0.709***	0.812***	0.695**	0.630***	0.636***	0.458
		(0.117)	(0.131)	(0.164)	(0.254)	(0.162)	(0.162)	(0.249)
Exclusion (CP)			0.810***			0.802***	0.808***	0.811***
			(0.114)			(0.116)	(0.116)	(0.116)
Gender(female)			-0.211			-0.215	-0.213	-0.211
			(0.114)			(0.116)	(0.116)	(0.116)
Physical Health (good-bad)			0.175**			0.177**	0.180**	0.181**
			(0.0637)			(0.0647)	(0.0647)	(0.0647)
Age²			0.000215***			0.000215***	0.000217***	0.000218***
			(0.0000573)			(0.0000578)	(0.0000579)	(0.0000579)
Partner HH (yes)			-0.774***			-0.781***	-0.773***	-0.781***
			(0.167)			(0.170)	(0.170)	(0.169)
Size HH			-0.499***			-0.497***	-0.497***	-0.489***
			(0.138)			(0.140)	(0.140)	(0.140)
Edu =medium			-0.0218			-0.0292	-0.0246	-0.0251
(ref.: low)			(0.171)			(0.174)	(0.174)	(0.174)
Edu =soph.			-0.191			-0.183	-0.174	-0.173
			(0.217)			(0.220)	(0.220)	(0.220)
Edu =high			-0.217			-0.225	-0.222	-0.223
			(0.204)			(0.206)	(0.206)	(0.206)
Level of Centralisation (ref.: Very Central)								
Central					-0.0883		0.0378	-0.0286
					(0.152)		(0.146)	(0.159)
Peripheral					-0.197		-0.177	-0.197
					(0.165)		(0.157)	(0.172)
Very Peripheral					-0.314		-0.247	-0.335
					(0.303)		(0.285)	(0.315)
Interaction								
Central #FR(1)					0.299			0.368
					(0.356)			(0.344)
Peripheral #FR(1)					0.0743			0.148
					(0.377)			(0.362)
Very Peripheral #FR(1)					0.240			0.484
					(0.668)			(0.661)
Constant	-1.904***	-2.093***	-2.378***	-2.085***	-1.996***	-2.375***	-2.360***	-2.350***
	(0.0612)	(0.0679)	(0.470)	(0.0688)	(0.0987)	(0.475)	(0.482)	(0.481)

Source: DEAS 2014

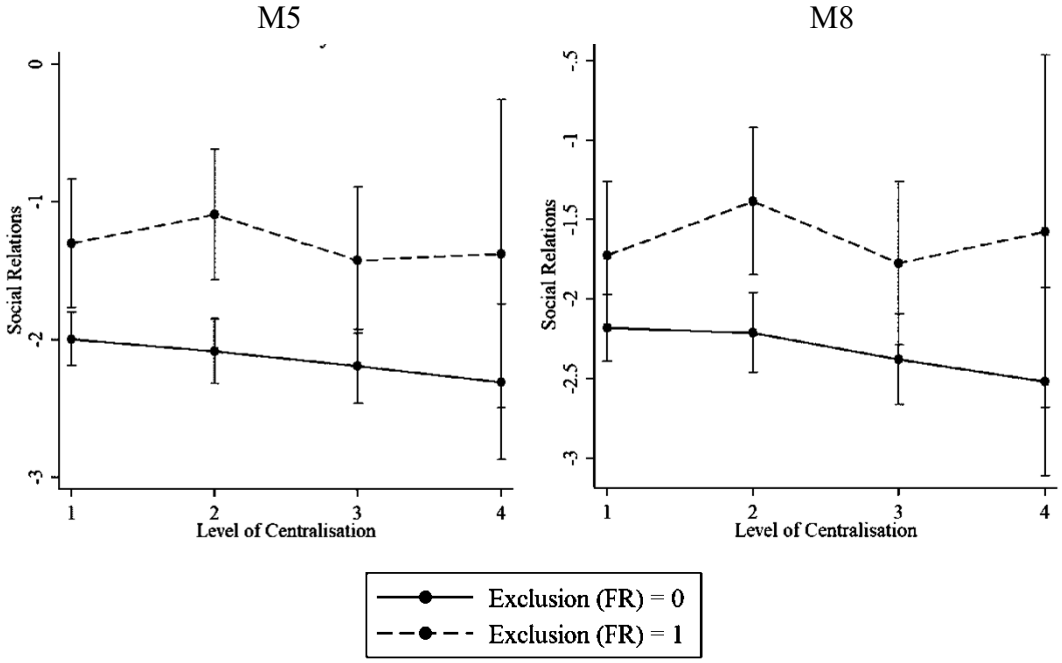
Table 17: All Multilevel Logistic Regression Models (M1 – M8) Exclusion from Social Relations (log-odds) (continued)

	M1	M2	M3	M4	M5	M6	M7	M8
Var(cons)	0.124***	00.123***	0.127***	0.118***	0.108***	0.125***	0.116***	0.112***
	(00.054)	(00.054)	(00.064)	(00.062)	(0.061)	(0.075)	(0.075)	(0.074)
var(Ex[FR])				0.741	0.741	0.376	0.380	0.356
				(0.384)	(0.382)	(0.346)	(0.345)	(0.340)
cov(Ex[FR],_cons)				-0.054	-0.049	-0.033	-0.029	-0.021
				(0.115)	(0.115)	(0.121)	(0.122)	(0.121)
Observations	3653	3653	3653	3653	3653	3653	3653	3653

Source: DEAS 2014

Figure 11 shows the interaction effect of "Exclusion from Financial Resources" and level of centralisation on "Exclusion from Social Relations". In accordance with the results from table 16, the 95%-confidence-intervals overlap, validating the insignificance of the interaction effects. When looking at the adjusted predictions, including important covariates into the model (M8) leads to stronger differences in the log-odds of "Exclusion from Social Relations" between excluded and non-excluded individuals, especially in central [2] and very peripheral [4] areas. Large standard errors are again due to a small number of observations in the sample. Even though the estimates are insignificant, the lines of the adjusted predictions are not parallel, especially in M8. In the complete model, estimates indicate lower log-odds of "Exclusion from Social Relations" with increasing periphery if individuals are not excluded from financial resources and higher log-odds if they are excluded from financial resources.

Figure 11: Adjusted Predictions of Exclusion from Social Relations by Level of Centralisation and Exclusion from Financial Resources



Source: DEAS 2014, own presentation

4. Conclusion and Discussion

The objective of this research was to investigate the association between financial and social capital across central and peripheral areas among older adults in Germany. In accordance with the literature, a threshold was chosen to investigate the effects of financial and social exclusion, whereby two dimensions of the latter were taken into account. It was hypothesised that exclusion from financial resources leads to a higher probability of exclusion from social relations (HI) and exclusion form civic participation (HII). Furthermore, it was expected that higher levels of centralisation within a district would lead to a lower probability of exclusion from civic participation (HIII) as well as a higher likelihood of exclusion from social relations (HIV). The final hypotheses stated that the effect of exclusion from financial resources on exclusion from civic participation and exclusion from social relations differs by level of centralisation, leading to higher chances of exclusion from civic participation when financially excluded in rather peripheral areas (HV) in comparison to rather central areas and lower chances of exclusion from social relations if excluded from financial resources in rather central areas (HVI). Following a descriptive analysis, a multilevel-logit-approach was utilized in order to account for clustered data and context effects. Descriptive results already indicated a cumulative effect of financial capital on social capital. Cases that were excluded from financial resources were distinctly more likely to also be excluded from social relations and civic participation (HI, HII). If distributed by level of centralisation, exclusion from social relations decreases with increasing periphery and exclusion from civic participation is higher in peripheral and very peripheral areas than in more central areas. Furthermore, these findings already indicate different mechanisms between financial capital and social capital across districts depending on their level of centralisation.

Initial descriptive results supported hypotheses I, II, III and IV. Results from the multilevel-logit-analysis reported strong and significant effects for exclusion from financial resources on exclusion from civic participation and social relations, though with limitations. Individuals who are excluded from financial resources are twice as likely to be excluded from civic participation and social relations than their financially non-excluded peers (HI, HII). Adding the context variable to the model on exclusion from civic participation revealed significant positive effects for the effect of peripheral regions and, conditional on the interaction terms, for very peripheral regions. However, the level of centralisation did not have any significant explanatory power in the model of exclusion from social relations, supporting HIII but not HIV. Data examination also revealed strong differences in between-district variance in the log-odds of exclusion from social relations and civic participation by exclusion from financial resources across different levels of centralisation. Between-district differences in exclusion from civic participation, whether excluded from financial resources or not, are greater in peripheral areas than all other. Furthermore, in very central and peripheral areas, between-district variance increases if individuals are excluded from financial resources, with a sharper increase for peripheral areas. These results indicate that peripheral districts vary much more than other districts. Based on the available data it is not possible to deduce whether these differences occur due to data inadequacy or because of existing differences in contextual and composition characteristics, as the sample size is too small to compute meaningful tests of significance. If coming research verifies the findings with significant effects, it will be interesting to investigate the reason for these strong differences between areas.

While the interaction terms investigated never indicated significance, they showed great power for financially excluded individuals in very peripheral regions. Though not significant,

interaction effects can be found for level of centralisation and exclusion from financial resources on both dependent variables. If financially non-excluded, the likelihood of exclusion from civic participation increases almost linearly by level of centralisation. The more peripheral an area, the higher the log-odds of being excluded from civic participation, if individuals are not excluded from financial resources. Across all levels of centralisation, financially excluded individuals score higher in log-odds of being excluded from civic participation, except for very peripheral regions, where financially excluded individuals score lower log-odds than their financially non-excluded peers.

In the model on exclusion from social relations, neither interaction effects, nor the context variable are significant. However, log-odds of exclusion from social relations decrease almost linearly with increasing periphery, if individuals are not excluded from financial relations. Interestingly, this pattern vanishes when looking at financially excluded individuals. If excluded from financial resources, log-odds of exclusion from social relations are highest in central and very peripheral areas. Due to a small sample size per district and insignificant results, these patterns are certainly not interpretable. However, if this trend only indicates the direction of the effect, further investigations could find interesting results. It will be interesting to investigate the underlying factors that lead to different outcomes in chances of being civically and/or socially excluded across different types of areas. Nevertheless, because these effects are mostly not significant and partly inverse to the hypothesised outcome, HV and HVI cannot be supported.

The analysis also showed that the effect of financial resources on exclusion from social relations and civic participation does not significantly vary between districts, if all important covariates are accounted for. Moreover, the results of the analysis are in accordance with previous findings on social capital and exclusion. Important covariates that were derived from existing literature, such as physical health and education for exclusion from civic participation and physical health as well as household size for exclusion from social relations have verified their power. Furthermore, the strong cumulative effect between different types of (social) capital could be verified in this analysis.

Due to the limited scope of a master thesis, there are a few limitations apparent in this paper. First, the sample size for each district was very small, leading to high standard errors and insignificant results, especially in interaction terms.
In this thesis, only one context variable was chosen as a predictor in the models, which could be extended by additional variables. Especially, because the level of centralisation is a spatial measure, it does not cover all aspects of centralisation, as a combination of spatial and population measurements could do. However, the construction of a single centralisation indicator, covering all aspects of centralisation, was considered to be beyond the time frame available. The addition of a second predictor, indicating population characteristics was rejected when the models were tested for multicollinearity. Future research could also focus on the extension of the still very limited knowledge on cultural differences regarding social capital and target for example migrant and non-migrant population comparisons.

Additionally, research on exclusion in old age would profit from mixed method approaches in order to identify, investigate and verify the mechanisms at work causally, in-depth and adequately. As this paper utilized only one cross sectional sample of DEAS data, it is not possible to derive causal answers in the association between financial and social capital poverty. The thresholds chosen are just one of many possible outcomes. Further studies

should test these thresholds or include other dimensions of financial exclusion, such as exclusion from basic material objects. Additionally, interdependencies between different dimensions of exclusion should be investigated in order to derive important results for political interventions. Kieran Walsh (2019) and colleagues demonstrated in their most current paper on rural old age exclusion the importance of multi-layered, multidimensional research that includes micro-, meso- and macro-level characteristics in order to investigate mediating factors that can promote or protect against specific disadvantages. This thesis approximates the idea of investigating interdependencies between old age, different domains of exclusion and macro-level processes such as centralisation by using a multilevel approach and acknowledging cross-level interactions. It would be interesting to extent the independent contextual variables by characteristics of demographic change, such as population shrinkage and internal or international migration (e.g. Huxhold, Fiori 2018).

Individuals' financial capital still has a great impact on their social capital, more specifically their relations and participation in society. Partially, this effect may vary between districts depending on their level of centralisation, even if this research could not find significant results. If securing social and civic rights is to be given high priority in the coming years and if factors in German rural districts actually amplify or weaken the importance of financial resources on social relations and civic participation, then the identification of these very factors is of utmost importance. With certainty, declining social capital in later life is an issue for Germany, which in the next few years will rather gain popularity than lose it. Global processes such as international migration, digitalisation and urbanisation will alter the composition of the population and their day-to-day life. Individuals in Germany and all over the world will life longer than ever before. The question will be how these individuals are able to be active, participate and see their role in society. Detailed analyses of important factors and mediators of exclusion across different types of space will help to develop effective small-scale policies that secure social and civic inclusion of a growing share of population.

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Appendix

Appendix 1: Descriptive Statistics by Level of Centralisation

Type of Area	M	SD	n
Very Central Areas			
Exclusion from Financial Resources	0.12	0.320	1,602
Exclusion from Social Relations	0.14	0.350	1,602
Exclusion from Civic participation	0.20	0.399	1,602
Gender (female)	0.47	0.499	1,602
Education	2.58	0.989	1,602
Physical Health	2.53	0.825	1,602
Age	74.09	6.066	1,602
Partner in Household	0.73	0.443	1,602
Household Size	1.81	0.637	1,602
Central Areas			
Exclusion from Financial Resources	0.15	0.361	995
Exclusion from Social Relations	0.14	0.346	995
Exclusion from Civic participation	0.20	0.398	995
Gender (female)	0.48	0.500	995
Education	2.55	0.949	995
Physical Health	2.57	0.792	995
Age	73.20	5.558	995
Partner in Household	0.75	0.433	995
Household Size	1.83	0.668	995
Peripheral Areas			
Exclusion from Financial Resources	0.20	0.397	859
Exclusion from Social Relations	0.13	0.341	859
Exclusion from Civic participation	0.27	0.443	859
Gender (female)	0.45	0.497	859
Education	2.50	0.940	859
Physical Health	2.68	0.802	859
Age	73.95	50.794	859
Partner in Household	0.77	0.424	859
Household Size	1.80	0.579	859
Very Peripheral Areas			
Exclusion from Financial Resources	0.14	0.350	197
Exclusion from Social Relations	0.12	0.322	197
Exclusion from Civic participation	0.25	0.433	197
Gender (female)	0.51	0.501	197
Education	2.66	0.920	197
Physical Health	2.59	0.748	197
Age	73.92	5.810	197
Partner in Household	0.78	0.418	197
Household Size	1.81	0.574	197

Appendix 2: Correlation Matrix Independent Variables

	Gender	Phy. Health	Edu-cation	Age	Partner HH	NR HH	Ex(FR)	Ex(SR)	Ex(CP)
Gender	1								
Physical Health	0.01	1							
Education	-0.27*	-0.12*	1						
Age	-0.04*	0.15*	-0.10*	1					
PartnerHH	-0.28*	-0.08*	0.16*	-0.17*	1				
NRHH	-0.21*	-0.04*	0.07*	-0.14*	0.62*	1			
Ex(FR)	0.06*	0.17*	-0.18*	-0.04*	-0.15*	0.03	1		
Ex(SR)	0.04*	0.11*	-0.09*	0.13*	-0.24*	-0.19*	0.15*	1	
Ex(CP)	-0.01	0.16*	-0.14*	0.14*	-0.05*	-0.04*	0.12*	0.17*	1
Level of Centrali-sation	-0.00	0.06*	-0.01	-0.01	0.03*	0.02	0.07*	-0.02	0.06*

* at least $p < 0.05$

Appendix 3: Model 7.1 vs. Model 7 for Likelihood-Ratio Test

Outcome	Exclusion from Civic Participation		Exclusion from Social Relations	
	CP M7	CP M7.1	SR M7	SR M7.1
Exclusion (FR)	0.381**	0.448***	0.636***	00.717***
	(0.140)	(0.116)	(0.162)	(0.131)
Exclusion (SR)	0.835***	0.843***	.	.
	(0.115)	(0.114)	.	.
Exclusion (CP)	.	.	0.808***	0.817***
	.	.	(0.116)	(0.114)
Gender(female)	-0.253**	-0.252**	-0.213	-0.209
	(0.0949)	(0.0940)	(0.116)	(0.114)
Physical Health (good-bad)	0.311***	0.309***	0.180**	0.177**
	(0.0540)	(0.0534)	(0.0647)	(0.0637)
Age²	0.000296***	0.000296***	0.000217***	0.000217***
	(0.0000496)	(0.0000491)	(0.0000579)	(0.0000574)
Partner HH	0.169	0.153	-00.773***	-00.767***
	(0.135)	(0.132)	(0.170)	(0.167)
Size HH	-0.0586	-0.0513	-0.497***	-0.499***
	(0.0917)	(0.0892)	(0.140)	(0.138)
Edu =medium	-0.269	-0.259	-0.0246	-0.0175
(ref.: low)	(0.145)	(0.143)	(0.174)	(0.171)
Edu =soph.	-0.666***	-0.661***	-0.174	-0.184
	(0.181)	(0.179)	(0.220)	(0.218)
Edu =high	-0.926***	-0.919***	-0.222	-0.213
	(0.174)	(0.172)	(0.206)	(0.204)
Level of Centralisation (ref.: Very Central)				
Central	0.000568	-0.00234	0.0378	0.0512
	(0.129)	(0.128)	(0.146)	(0.145)
Peripheral	0.276*	0.280*	-0.177	-0.159
	(0.131)	(0.131)	(0.157)	(0.155)
Very Peripheral	0.352	0.363	-0.247	-0.226
	(0.230)	(0.226)	(0.285)	(0.282)
Constant	-3.580***	-3.587***	-2.360***	-2.375***
	(0.408)	(0.403)	(0.482)	(0.476)
Var(_cons)	0.141	0.125***	0.117***	0.123***
	(.064)	(.049)	(0.075)	(0. 064)
Var(Ex(FR))	0.354***		0.381	
	(0.228)		(0.345)	
Cov(Ex(FR),_cons)	-0.083		-0.029	
	(0.095)		(0.122)	
Observations	3,653	3,653	3,653	3,653

Appendix 4: Stata .do-file

```
/*******************************************************************************
Master Thesis
Dataset: DEAS
User: Lea Fobel
*******************************************************************************/

*****************************************************************
                        Merging Education and Context Variables
*****************************************************************

use "C:\Users\leafo\Documents\01_Master Thesis\edu_all_waves.dta"

**education variables 1996-2014**
merge 1:1 fallnum using "C:\Users\leafo\Documents\01_Master
Thesis\SUF_DEAS_2014_1-0_en_Stata12.dta"

gen edu4=.
replace edu4=1 if bildung4_96==1 | bildung4_02==1 |  bildung3_08==1 |
bildung4_11==1 |  bildung4_14==1
replace edu4=2 if bildung4_96==2 | bildung4_02==2 |  bildung3_08==2 |
bildung4_11==2 |  bildung4_14==2
replace edu4=3 if bildung4_96==3 | bildung4_02==3 |  bildung3_08==3 |
bildung4_11==3 |  bildung4_14==3
replace edu4=4 if bildung4_96==4 | bildung4_02==4 |  bildung3_08==4 |
bildung4_11==4 |  bildung4_14==4

save "C:\Users\leafo\Documents\01_Master Thesis\Fobel_MT_DEAS.dta",replace

use "C:\Users\leafo\Documents\01_Master Thesis\2-lvl
data\DEAS2014_Fobel_Kreisindikatoren.dta"
merge 1:1 fallnum using "D:\01_Master Thesis\test.dta"

lab var age_share "Share of people aged 65+"
lab var ktyp4_num "Settlement Structure (Urban - rural)"
lab var raumt2010lage_kreis_num "Level of Centralisation"

**Merge missing district to Goettingen
replace fiktiv_kreis_14=298 if raumt2010lage_kreis_num==.
replace ktyp4_num=2 if fiktiv_kreis_14==298
replace raumt2010lage_kreis_num=2 if fiktiv_kreis_14==298
replace age_share=22 if fiktiv_kreis_14==298

graph set window fontface "Times New Roman"

*recode relevant variables  // recode first important variables
clonevar nrhh=hc323
recode nrhh (95=1)
tab nrhh

clonevar edu=hc27
recode edu (9=0) (8=.a)
tab edu

clonevar sex=hc1
recode sex (1=0) (2=1)
tab sex
lab def sex 0"male" 1"female"
lab val sex sex

gen mig=migrat_14
```

```
recode mig (2=1)
lab def mig 0"Native" 1"Migrant"
lab val mig mig

*check multicollinearity
pwcorr sex mig health hc802neu yedu edu alter_14,star(5)

/**Dependent Variables
*Group-get-togetehr:
tab1 hc433 hc433a_2 hc433a_3 hc433a_4 hc433a_5 hc433a_6
factor hc433 hc433a_3 hc433a_4 hc433a_5 hc433a_6
factor hc433 hc433a_3 hc433a_4 hc433a_5 hc433a_6 ,pcf
rotate
factor hc433 hc433a_3 hc433a_4 hc433a_5 hc433a_6 ,pcf
rotate, oblimin oblique

*political
tab1 hd63_3 hd24 hc425_5
*web
factor hd28_1 hd28_2
*contact
tab1 hd61 nwgroesse_14
*religion
tab1 hd14 hd14o hd15
recode hd14 (1/6=1) (7=0), gen(religion)
tab religion
factor religion hd15 hc429
*classes
tab1 hc432a_1 hc432a_2 hc432a_3 hc432a_4 hc432a_5 hc432a_6 hc432a_v
hc432a_w hc432
factor hc432a_2 hc432a_3 hc432a_4 hc432a_5 hc432a_6,pcf
*boards
hc431 hc431a_1 hc431a_2 hc431a_3 hc431a_4 hc431a_5 hc431a_6 hc431a_v
hc431a_w
*sport
hc430 hc430a_1 hc430a_2 hc430a_3 hc430a_4 hc430a_5 hc430a_6 hc430a_v
hc430a_w
*culture
hc429 hc429a_1 hc429a_2 hc429a_3 hc429a_4 hc429a_5 hc429a_6 hc429a_v
hc429a_w
*artistic
hc428 hc428a_1 hc428a_2 hc428a_3 hc428a_4 hc428a_5 hc428a_6 hc428a_v
hc428a_w
*doing sport
hc427 hc427o1 hc427o2 hc427a_1 hc427a_2 hc427a_3 hc427a_4 hc427a_5 hc427a_6
hc427a_v hc427a_w
*going for walks
hc426 hc426o1 hc426o2 hc426a_1 hc426a_2 hc426a_3 hc426a_4 hc426a_5 hc426a_6
hc426a_v hc426a_w
*frequency
tab1 hc425_1 hc425_2 hc425_3 hc425_4 hc425_5 hc425_6 hc425_7 hc425_8
factor hc425_6 hc425_5 hc425_3,pcf //gut
*closeness
tab1 hc241 hd3_1 hd29_6
*lonely
hc504_11
*number of people
factor hc272 hc323 hd62 nwgroesse_14 nrhh
*/
gen agesq=alter_14*alter_14

*nbh
```

```
tab1 hd63_3 hd63_2 hd61

*********************************************************************
                  Dependent Variable Social Relations
*********************************************************************
**Social Isolation (Scharf)
*1)
tab hc318_13 //no living relatives OR meetings with relatives less than
once a week
tab1 hc3081 hc3082 hc3083 hc3084 hc311a1 hc311a2 hc311a3 hc311a4 hc316h11
hc316h12 hc316h13 hc316h14 hc316h31 hc316h32 hc316h33 hc316h34

*2) no firends in nbh OR chats/meetins with friends less than once a week
tab hc425_6 //fre last 12 month freinds and acquan.
tab1 hc425_6 hc603_1 hc603_2 hc603_3 hc603_4 hc603_5 hc603_6 hc603_7
hc603_8 //distance people

*3) chat/meeting with nbh less than once a week
tab hd61

**Gen Scores to add
recode hc318_13 hd61 hc3081  hc3082  hc3083  hc3084  hc311a1  hc311a2
hc311a3  hc311a4  hc316h11  hc316h12  hc316h13  hc316h14  hc316h31 hc316h32
hc316h33  hc316h34 hc425_6 hc603_1  hc603_2   hc603_3   hc603_4   hc603_5
hc603_6   hc603_7   hc603_8 (.a .b .c .d .e .f .g .h=.)

**Category 1
gen sore14=.
replace sore14=1  if hc318_13==1
replace sore14=1  if hc3081>=4 & hc3081!=. & hc3081!=.b & hc3081!=.a &
hc3081!=.c & anzkind_14>0
replace sore14=1  if hc3082>=4 & hc3082!=. & hc3082!=.b & hc3082!=.a &
hc3082!=.c & anzkind_14>1
replace sore14=1  if hc3083>=4 & hc3083!=. & hc3083!=.b & hc3083!=.a &
hc3083!=.c & anzkind_14>2
replace sore14=1  if hc3084>=4 & hc3084!=. & hc3084!=.b & hc3084!=.a &
hc3084!=.c & anzkind_14>3
replace sore14=0  if hc3081<4 & hc3081!=. & hc3081!=.b & hc3081!=.a &
hc3081!=.c & anzkind_14>0
replace sore14=0  if hc3082<4 & hc3082!=. & hc3082!=.b & hc3082!=.a &
hc3082!=.c & anzkind_14>1
replace sore14=0  if hc3083<4 & hc3083!=. & hc3083!=.b & hc3083!=.a &
hc3083!=.c & anzkind_14>2
replace sore14=0  if hc3084<4 & hc3084!=. & hc3084!=.b & hc3084!=.a &
hc3084!=.c & anzkind_14>3
**wenn keine Kinder:
replace sore14=1  if anzkind_14==0

tab sore14
replace sore14=0  if hc316h31<4 & hc316h31!=. & hc316h31!=.b & hc316h31!=.a
& hc316h31!=.c & hc314a1>1
replace sore14=0  if hc316h11<4 & hc316h11!=. & hc316h11!=.b & hc316h11!=.a
& hc316h11!=.c & hc314a1==1
replace sore14=0  if hc316h32<4 & hc316h32!=. & hc316h32!=.b & hc316h32!=.a
& hc316h32!=.c & hc314a2>1
replace sore14=0  if hc316h12<4 & hc316h12!=. & hc316h12!=.b & hc316h12!=.a
& hc316h12!=.c & hc314a2==1
replace sore14=0  if hc316h33<4 & hc316h33!=. & hc316h33!=.b & hc316h33!=.a
& hc316h33!=.c & hc314a3>1
replace sore14=0  if hc316h13<4 & hc316h13!=. & hc316h13!=.b & hc316h13!=.a
& hc316h13!=.c & hc314a3==1
```

```
replace sore14=0  if hc316h34<4 & hc316h34!=. & hc316h34!=.b & hc316h34!=.a
& hc316h34!=.c & hc314a4>1
replace sore14=0  if hc316h14<4 & hc316h14!=. & hc316h14!=.b & hc316h14!=.a
& hc316h14!=.c & hc314a4==1
replace sore14=1  if hc316h31>=4 & hc316h31!=. & hc316h31!=.b &
hc316h31!=.a & hc316h31!=.c & hc314a1>1
replace sore14=1  if hc316h11>=4 & hc316h11!=. & hc316h11!=.b &
hc316h11!=.a & hc316h11!=.c & hc314a1==1
replace sore14=1  if hc316h32>=4 & hc316h32!=. & hc316h32!=.b &
hc316h32!=.a & hc316h32!=.c & hc314a2>1
replace sore14=1  if hc316h12>=4 & hc316h12!=. & hc316h12!=.b &
hc316h12!=.a & hc316h12!=.c & hc314a2==1
replace sore14=1  if hc316h33>=4 & hc316h33!=. & hc316h33!=.b &
hc316h33!=.a & hc316h33!=.c & hc314a3>1
replace sore14=1  if hc316h13>=4 & hc316h13!=. & hc316h13!=.b &
hc316h13!=.a & hc316h13!=.c & hc314a3==1
replace sore14=1  if hc316h34>=4 & hc316h34!=. & hc316h34!=.b &
hc316h34!=.a & hc316h34!=.c & hc314a4>1
replace sore14=1  if hc316h14>=4 & hc316h14!=. & hc316h14!=.b &
hc316h14!=.a & hc316h14!=.c & hc314a4==1

**Category 2
gen sore2_n=.
replace sore2_n=1  if hc425_6>=4 & hc425_6!=. | hc603_1>3 & hc603_1!=. |
hc603_2>3 & hc603_2!=. ///
| hc603_3 >3 & hc603_3!=. | hc603_4 >3 & hc603_4!=. | hc603_5 >3 &
hc603_5!=. | ///
hc603_6 >3 & hc603_6!=. | hc603_7 >3 & hc603_7!=. | hc603_8>3 & hc603_8!=.
replace sore2_n=0  if hc425_6<4 & hc425_6!=. | hc603_1<=3 & hc603_1!=. |
hc603_2 <=3 & hc603_2!=. ///
| hc603_3 <=3 & hc603_3!=. | hc603_4 <=3 & hc603_4!=. | hc603_5 <=3 &
hc603_5!=. | ///
hc603_6 <=3 & hc603_6!=. | hc603_7 <=3 & hc603_7!=. | hc603_8<=3 &
hc603_8!=.

/*

**new Sore 3*
gen sore3_n=.
replace sore3_n=1  if hd61>=4
replace sore3_n=0 if hd61<4
replace sore3_n=. if hd61==. |hd61==.e | hd61==.f | hd61==.g
browse sore*

**Loneliness:
bysort socialrel: sum lone6_14
pwcorr lone6_14 socialrel,star(5)
recode lone6_14 (1/2.9=0) (3/4=1),gen(lonely)

*add loneliness to social relation score if lonely=1
gen sore4=.
replace sore4=1  if lonely==1
replace sore4=0 if lonely==0
recode lonely (.e .f .g=.)

gen sore34=.
replace sore34=1 if sore4==1 | sore3_n==1
replace sore34=0 if lonely==0 & sore3_n==0
gen socialrel_new_lonely3=sore14+sore2_n+sore34 //final index with lonely
and 4 point scale
recode socialrel_new_lonely3 (0 1=0) (2 3=1),gen(socialrel_new_lonely_3d)
```

```
replace socialrel_new_lonely_3d=1 if sore14==1 & sore2_n==1 & sore34==.
//to include all that are surely excluded
replace socialrel_new_lonely_3d=1 if sore14==1 & sore2_n==. & sore34==1
replace socialrel_new_lonely_3d=1 if sore14==. & sore2_n==1 & sore34==1

sum sore14 sore2_n sore34 if alter_14 >=65
tab sore14 socialrel_new_lonely3
tab sore2_n socialrel_new_lonely3
tab sore34 socialrel_new_lonely3

**Final SR variables
socialrel_new_lonely_d
socialrel_new_d

sum sore14 sore2_n sore34 if alter_14>64

*****************************************************************
                  Dependent Variable Civic Participation
*****************************************************************
tab1 hc429 hc431 hc432 hc433,mis
recode hc429 hc431 hc432 hc433 ehramt_14 ehramt_weit_14 (.a .b .f=.)

*dichotomisation detail
*hc429 hc431 hc432 hc433 hc425_5 ehramt_weit_14
recode hc429 (1/4=0) (4/6=1),gen(ce)
recode hc431 (1/4=0) (4/6=1),gen(bg)
recode hc432 (1/4=0) (4/6=1),gen(cl)
recode hc433 (1/4=0) (4/6=1),gen(pg)
recode hc425_5 (1/4=0) (4/6=1),gen(pm)
*überprüfung
gen civilpartfin=. //FINAL DV CP
replace civilpartfin=1 if ce==1 & bg==1 & cl==1 & pg==1 & pm==1 &
ehramt_weit_14==0
replace civilpartfin=0 if ce==0 | bg==0 | cl==0 | pg==0 | pm==0 |
ehramt_weit_14==1

sum ce bg cl pg pm ehramt_weit_14 if alter_14>64

lab var health "health 1 very good - 5 very bad"
clonevar perinc=hd64 // perceived income; cope with financial situation

*****************************************************************
                  Dependent Variable Financial Resources
*****************************************************************
tab hd64
tab hheink_14
tab einkarm_14
recode perinc (1 2=1) (3 4 5 =0),gen(copebad)
gen financap=copebad+einkarm_14
recode financap (1 2=1),gen(financap_d) // include obs eben if copebad was
not answered
replace financap_d=1 if einkarm_14==1 & copebad==. | einkarm_14==1 &
copebad==.e | einkarm_14==1 & copebad==.f | einkarm_14==1 & copebad==.g
replace financap_d=1 if copebad==1 & einkarm_14==. | copebad==1 &
copebad==.e | copebad==1 & copebad==.f | copebad==1 & copebad==.g

sum aee_oecd_14,d //1500 = median

**test other lines of poverty
gen finex=.
replace finex=0 if aee_oecd_14>=900
replace finex=1 if aee_oecd_14<900
```

```
replace finex=2 if aee_oecd_14<750

tab aee_oecd_14 if aee_oecd_14<750 //less than 50% of median
tab aee_oecd_14 if aee_oecd_14<900 //less than 60% of median
display (1500/100)*60

gen finex50=.
replace finex50=0 if aee_oecd_14>=750
replace finex50=1 if aee_oecd_14<750
replace finex50=. if aee_oecd_14==.f

gen finex60=.
replace finex60=0 if aee_oecd_14>=900
replace finex60=1 if aee_oecd_14<900
replace finex60=. if aee_oecd_14==.f

sum finex50 finex60

gen financap50=copebad+finex50
recode financap50 (1 2=1),gen(financap_d50) // include obs eben if copebad
was not answered
replace financap_d50=1 if finex50==1 & copebad==. | finex50==1 &
copebad==.e | finex50==1 & copebad==.f | finex50==1 & copebad==.g
replace financap_d50=1 if copebad==1 & finex50==. | copebad==1 &
copebad==.e | copebad==1 & copebad==.f | copebad==1 & copebad==.g

/*test simple logistic regression with robust SE
logit socialrel_new_lonely_3d i.financap_d if alter_14>64,or
cluster(fiktiv_kreis_14) //2.63***
estimates store Test1
logit socialrel_new_lonely_3d i.financap60AND if alter_14>64,or
cluster(fiktiv_kreis_14) //3.05***
estimates store Test2
logit socialrel_new_lonely_3d i.financap_d50 if alter_14>64,or
cluster(fiktiv_kreis_14) //2.46***
estimates store Test3
logit socialrel_new_lonely_3d i.financap_d60 if alter_14>64,or
cluster(fiktiv_kreis_14) //2.62***
estimates store Test4

logit civilpartfin i.financap_d if alter_14>64,or cluster(fiktiv_kreis_14)
//2.30**
estimates store Test5
logit civilpartfin i.financap60AND if alter_14>64,or
cluster(fiktiv_kreis_14) //1.93**
estimates store Test6
logit civilpartfin i.financap_d50 if alter_14>64,or
cluster(fiktiv_kreis_14) //2.20***
estimates store Test7
logit civilpartfin i.financap_d60 if alter_14>64,or
cluster(fiktiv_kreis_14) //2.29***
estimates store Test8

esttab Test1 Test2 Test3 Test4 Test5 Test6 Test7 Test8 using "E:\01_Master
Thesis\FR\FR_Vergeich.rtf", label ///
title(Logistic Regression with cluster robust SE) ///
mtitles ("Ori" "AND" "50" "60" "Ori" "AND" "50" "60") ///
varwidth(50) compress ///
nogaps ///
se ///
nobaselevels ///
eform ///
```

```
constant ///
nonumbers ///
addnote("Source: DEAS 2014") rtf replace

*/

gen financap60=copebad+finex60
recode financap60 (1 2=1),gen(financap_d60) // include obs eben if copebad
was not answered
replace financap_d60=1 if finex60==1 & copebad==. | finex60==1 &
copebad==.e | finex60==1 & copebad==.f | finex60==1 & copebad==.g
replace financap_d60=1 if copebad==1 & finex60==. | copebad==1 &
copebad==.e | copebad==1 & copebad==.f | copebad==1 & copebad==.g

gen financap60AND=.
replace financap60AND=1 if finex60==1 & copebad==1
replace financap60AND=0 if finex60==0 & copebad==1
replace financap60AND=0 if finex60==1 & copebad==0
replace financap60AND=0 if finex60==0 & copebad==0
replace financap60AND=. if copebad==.e | copebad==.f | copebad==.g
tab financap60AND //3%

sum einkarm_14 financap_d financap60AND financap_d50 financap_d60

*********************************************************************
                          Descriptive Statistics
*********************************************************************
estpost tabstat sex mig health bildung4_14 alter_14 financap_d
socialrel_new_lonely_3d civilpartfin partnerhh nrhh if alter_14>64,
by(bbsr_kreistyp_14) statistics(mean p50 sd count) nototal
columns(statistics)

sum sex edu4 health alter_14 financap_d socialrel_new_lonely_3d
civilpartfin partnerhh nrhh

tab1 sex mig health bildung4_14 alter_14 socialrel_new_lonely_3d
civilpartfin partnerhh nrhh if alter_14>64

bysort financap_d: sum socialrel_new_lonely_3d civilpartfin if alter_14>64

***Final descriptives thesis import:
sum ce bg cl pg pm ehramt_weit_14 if alter_14>64
sum sore14 sore2_n sore34 if alter_14>64
sum financap_d civilpartfin socialrel_new_lonely_3d if alter_14>64
bysort financap_d: sum socialrel_new_lonely_3d civilpartfin if alter_14>64

bysort financap_d: sum socialrel_new_lonely_3d civilpartfin if alter_14>64
bysort raumt2010lage_kreis_num: sum financap_d socialrel_new_lonely_3d
civilpartfin

*bysort raumt2010lage_kreis_num: sum financap_d socialrel_new_lonely_3d
civilpartfin sex mig health bildung4_14 alter_14 partnerhh nrhh
bysort raumt2010lage_kreis_num: sum  sex edu4 health alter_14 partnerhh
nrhh financap_d socialrel_new_lonely_3d civilpartfin

pwcorr sex health edu4 alter_14 partnerhh nrhh financap_d
socialrel_new_lonely_3d civilpartfin raumt2010lage_kreis_num, star(5)
//check multikollinearity
estpost correlate sex health edu4 alter_14 partnerhh nrhh financap_d
socialrel_new_lonely_3d civilpartfin raumt2010lage_kreis_num, matrix
listwise //check multikollinearity
est store c1
```

```
esttab * using
"C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Data\corrmatne
w.rtf", unstack not noobs compress

table financap_d raumt2010lage_kreis_num, contents(mean civilpartfin)
table financap_d raumt2010lage_kreis_num, contents(mean
socialrel_new_lonely_3d)
table socialrel_new_lonely_3d financap_d raumt2010lage_kreis_num

tab3way civilpartfin financap_d raumt2010lage_kreis_num, colpct
tab3way socialrel_new_lonely_3d financap_d raumt2010lage_kreis_num, colpct

lab def lage 1"very central" 2"central" 3"peripheral" 4"very peripheral"
lab val raumt2010lage_kreis_num lage

lab var financap_d "Exclusion from financial Resources"
lab var socialrel_new_lonely_3d "Exclusion from Social Relations"
lab var civilpartfin "Exclusion from Civil Participation"
lab var financap_d50 "Exclusion from financial Resources (50%)"
lab var financap60AND "Exclusion from financial Resources (60 and
struggling)"
lab var financap_d60 "Exclusion from financial Resources (60%)"

tab raumt2010lage_kreis_num if alter_14>64
sum age_share raumt2010lage_kreis_num ktyp4_num
sum age_share raumt2010lage_kreis_num ktyp4_num if alter_14>64
pwcorr ktyp raumt2010,star(5)
pwcorr age_share raumt2010,star(5) //korreliert mehr als ktyp
pwcorr age_share ktyp,star(5) // korreliert weniger als Lage

gen overallexclusion=civilpartfin+financap_d+socialrel_new_lonely_3d
graph pie overallexclusion

*only reg vars
sum financap_d socialrel_new_lonely_3d civilpartfin sex edu4 health
alter_14 partnerhh nrhh
bysort financap_d: sum socialrel_new_lonely_3d civilpartfin

bysort raumt2010lage_kreis_num: sum financap_d socialrel_new_lonely_3d
civilpartfin sex edu4 health alter_14 partnerhh nrhh
bysort raumt2010lage_kreis_num: sum sex edu4 health alter_14 partnerhh nrhh
estpost summarize financap_d socialrel_new_lonely_3d civilpartfin sex
health alter_14 partnerhh nrhh
 esttab, cells("count mean sd min max")

bysort raumt2010lage_kreis_num: estpost sum financap_d
socialrel_new_lonely_3d civilpartfin sex health alter_14 partnerhh nrhh
 esttab, cells("count mean sd min max")


**********************************************************************
                        Simple Regression try out
**********************************************************************
logit socialrel_new_lonely_3d if alter_14>64,or
logit socialrel_new_lonely_3d i.financap_d if alter_14>64,or
cluster(fiktiv_kreis_14)
logit socialrel_new_lonely_3d i.financap_d raumt2010lage_kreis_num if
alter_14>64,or cluster(fiktiv_kreis_14)
logit socialrel_new_lonely_3d i.financap_d raumt2010lage_kreis_num if
alter_14>64,or
logit socialrel_new_lonely_3d i.financap_d ktyp4_num if alter_14>64,or //
area not significant on SR or CP
```

```
*check if area affects FR
logit financap_d i.raumt2010lage_kreis_num i.socialrel_new_lonely_3d
i.civilpartfin if alter_14>64,or
logit financap_d i.socialrel_new_lonely_3d i.civilpartfin i.sex c.health
c.alter_14 i.partnerhh i.raumt2010lage_kreis_num c.nrhh if alter_14>64, or
cluster(fiktiv_kreis_14)
logit socialrel_new_lonely_3d i.civilpartfin i.sex c.health c.alter_14
i.partnerhh i.raumt2010lage_kreis_num c.nrhh if alter_14>64, or
cluster(fiktiv_kreis_14)
logit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex c.health
c.alter_14 i.partnerhh c.age_share i.raumt2010lage_kreis_num c.nrhh if
alter_14>64, or cluster(fiktiv_kreis_14)
logit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex c.health
c.alter_14 i.partnerhh c.age_share i.raumt2010lage_kreis_num c.nrhh if
alter_14>64, or cluster(fiktiv_kreis_14)
logit civilpartfin i.socialrel_new_lonely_3d i.sex c.health c.alter_14
i.partnerhh i.raumt2010lage_kreis_num c.nrhh if alter_14>64, or
cluster(fiktiv_kreis_14)

logit financap_d i.socialrel_new_lonely_3d i.civilpartfin i.sex c.health
c.alter_14 i.partnerhh c.nrhh if alter_14>64, or cluster(fiktiv_kreis_14)

logit civilpartfin GRW_20062015,or
logit civilpartfin GRW_20112015
logit socialrel_new_lonely_3d i.raumt2010lage_kreis_num,or
logit civilpartfin c.age_share if alter_14>64,or
logit socialrel_new_lonely_3d c.age_share if alter_14>64,or
logit financap_d c.age_share if alter_14>64,or

logit civilpartfin i.age_share if alter_14>64,or
logit financap_d i.age_share if alter_14>64,or

. display .0040286*100
.40286

. display exp(.40286)
1.496097

pwcorr raumt2010lage_kreis_num GRW_20062015
pwcorr raumt2010lage_kreis_num GRW_20112015,star(5)
pwcorr raumt2010lage_kreis_num GRW_20062015,star(5)

***INTERACTION

xtmelogit civilpartfin i.financap_d##i.raumt2010lage_kreis_num ||
fiktiv_kreis_14: if alter_14>64,or var
logit civilpartfin i.financap_d##i.raumt2010lage_kreis_num, or
margins, at(raumt2010lage_kreis_num=(1,2,3,4) financap_d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)
saving("C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Tables\
interaction.rtf", replace)

margins i.raumt2010lage_kreis_num#i.financap_d, atmeans
margins, at(raumt2010lage_kreis_num=(1,2,3,4) financap_d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)
saving("C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Tables\
interaction.rtf", replace)
```

```
*/
log using "D:\01_Master Thesis\log_margin",replace text
logit civilpartfin i.financap_d##i.raumt2010lage_kreis_num
i.socialrel_new_lonely_3d i.sex c.health c.alter_14 i.partnerhh c.nrhh , or
cluster(fiktiv_kreis_14)
margins, at(raumt2010lage_kreis_num=(1,2,3,4) financap_d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)
margins, dydx(raumt2010lage_kreis_num financap_d)
margins, dydx(raumt2010lage_kreis_num financap_d) atmeans
log using "D:\01_Master Thesis\log_margin2",replace text
margins raumt2010lage_kreis_num financap_d, atmeans
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)
log close

log using "D:\01_Master Thesis\log_multilevel",replace text
xtmelogit civilpartfin i.financap_d##i.raumt2010lage_kreis_num
i.socialrel_new_lonely_3d i.sex c.health c.alter_14 i.partnerhh c.nrhh||
fiktiv_kreis_14: i.raumt2010lage_kreis_num if alter_14>64, or
*margins, dydx(financap_d) at (raumt2010lage_kreis_num=(1 2 3 4)) vsquish
post
log close

log using "D:\01_Master Thesis\log_multilevelwi",replace text
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d
i.raumt2010lage_kreis_num i.sex c.health c.alter_14 i.partnerhh c.nrhh||
fiktiv_kreis_14: if alter_14>64, or
*margins, dydx(financap_d) at (raumt2010lage_kreis_num=(1 2 3 4)) vsquish
post
log close

/*
logit civilpartfin i.financap_d##i.raumt2010lage_kreis_num, or
margins, dydx(*)
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)

margins r.financap_d r.raumt2010lage_kreis_num

**FIST TABLE:
logit socialrel_new_lonely_3d if alter_14>64,or cluster(fiktiv_kreis_14)
estimates store RE1
logit socialrel_new_lonely_3d i.financap_d if alter_14>64,or
cluster(fiktiv_kreis_14)
estimates store RE2
logit civilpartfin if alter_14>64,or cluster(fiktiv_kreis_14)
estimates store RE4
logit civilpartfin i.financap_d if alter_14>64,or cluster(fiktiv_kreis_14)
estimates store RE5
*/

esttab RE1 RE2 RE4 RE5 using
"C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Tables\first_r
obust_models.rtf", label ///
title(Logistic Regression with cluster robust SE) ///
mtitles ("Empty Model" "Main DV" "Empty Model" "Main DV") ///
varwidth(50) compress ///
nogaps ///
```

```
nobaselevels ///
eform ///
constant ///
nonumbers ///
addnote("Source: DEAS 2014") rtf replace

logit socialrel_new_lonely_3d if alter_14>64,or cluster(fiktiv_kreis_14)
estimates store RE1
logit socialrel_new_lonely_3d i.financap_d if alter_14>64,or
cluster(fiktiv_kreis_14)
estimates store RE2
logit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex c.health
c.alter_14 i.partnerhh c.nrhh if alter_14>64, or cluster(fiktiv_kreis_14)
estimates store RE3
logit civilpartfin if alter_14>64,or cluster(fiktiv_kreis_14)
estimates store RE4
logit civilpartfin i.financap_d if alter_14>64,or cluster(fiktiv_kreis_14)
estimates store RE5
logit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex c.health
c.alter_14 i.partnerhh c.nrhh if alter_14>64, or cluster(fiktiv_kreis_14)
estimates store RE6

esttab RE1 RE2 RE3 RE4 RE5 RE6 using
"C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Tables\robust_
models_se.rtf", label ///
title(Logistic Regression with cluster robust SE) ///
mtitles ("Empty Model" "Main DV" "Covariates" "Empty Model" "Main DV"
"Covariates") ///
varwidth(50) compress ///
nogaps ///
se ///
nobaselevels ///
eform ///
constant ///
nonumbers ///
addnote("Source: DEAS 2014") rtf replace

*********************************************************************
                        Multilevel analysis CP
*********************************************************************
                        Random intercept
*********************************************************************

*********
**Empty**
*********
xtmelogit civilpartfin || fiktiv_kreis_14:, covariance(unstructured) mle
var
estimates store xtemp
estat icc
/*likelihood-ratio test for null hypothesis that the residual between-
cluster variance is zero. For this
model, the lr statistic is 32.08 giving p>0.001 which suggests that a
multilevel model is required
The p-values are based on the correcr asymptotic sampling distribution. */
//VPC/ICC
display .1888577/(.1888577+3.29) //= 5% of the residual variation in the
propensity to be civially excluded is attributable to unobservable district
characteristics
estat icc
******
**FR**
```

```
******
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14:,
covariance(unstructured) mle var or
estimates store xtfr //lr also significant
//some change in between variance --> IV not similar across districts
//some disricts may be wealthier than others
estat icc
correlate civilpartfin financap_d, covariance

******
**All*
******
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: ,
covariance(unstructured) mle var or
estimates store xtall //lr still significant
estat icc

*********************************************************************
                        Multilevel analysis CP
*********************************************************************
                        Random intercept + random coef.
*********************************************************************

******
**FR**
******
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d,
covariance(unstructured) mle var or
estimates store xtfrsl //lr also significant
estat icc
predict predprob11
gen predlogit11 = logit(predprob11)
egen pickone11 = tag(fiktiv_kreis_14 financap_d)
gen multifin4 = pickone11
bys fiktiv_kreis_14 (financap_d): replace multifin4 = 0 if
financap_d[_N]==financap_d[1]
*line predlogit11 financap_d if multifin3==1, connect(ascending)
twoway connected predlogit11 financap_d if pickone11==1 & multifin4==1,
connect(ascending) ///
ytitle(Predicted log-odds) xtitle(Exclusion from Financial Resouces)
sum predlogit11 if financap_d==1 // predlogit between -1.363514 and
.6647822
display exp(-1.363514)/[1+exp(-1.363514)] //.20366978
display exp(.6647822)/[1+exp(.6647822)] //.66033382
sum predlogit11 if financap_d==0 // predlogit between -2.029966 and -
.2070083
display exp(-2.029966)/[1+exp(-2.029966)] //.11609241
display exp(-.207008)/[1+exp(-.207008)] //.44843202

twoway function -1.464618 + (2*(-.1513588))*x+.5414723*x^2, range (0 1)

******
**All*
******
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d,
covariance(unstructured) mle var or
estimates store xtallsl //lr still significant
estat icc
*M5
```

```
xtmelogit civilpartfin i.financap_d##i.raumt2010lage_kreis_num  ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var or
estimates store M5 //lr still significant
estat icc
esttab M5 using "P:\Master Thesis\tables\CP_M5.rtf", label ///
title(Logistic Regression with cluster robust SE) ///
mtitles ("M5") ///
varwidth(50) compress ///
nogaps ///
se ///
nobaselevels ///
constant ///
nonumbers ///
addnote("Source: DEAS 2014") rtf replace
*********************************************************************
                        Multilevel analysis CP
*********************************************************************
                        Contextual Effects
*********************************************************************

xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var or
estimates store xtcon //lr still significant
estat icc
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.ktyp4_num || fiktiv_kreis_14:
financap_d, covariance(unstructured) mle var
estimates store xtconur //lr still significant
estat icc
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.ktyp4_num || fiktiv_kreis_14:
financap_d ktyp4_num, covariance(unstructured) mle var
estimates store xtconur //lr still significant
estat icc
********************
*****Interaction****
********************
xtmelogit civilpartfin i.socialrel_new_lonely_3d i.sex c.health c.agesq
i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num##financap_d ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var
estimates store xtint //lr still significant
estat icc
xtmelogit civilpartfin i.socialrel_new_lonely_3d i.sex c.health c.agesq
i.partnerhh c.nrhh i.edu4 i.ktyp4_num##financap_d || fiktiv_kreis_14:
financap_d, covariance(unstructured) mle var
estimates store xtintur //lr still significant
estat icc
esttab xtemp xtfr xtall xtfrsl xtallsl xtcon xtint using
"C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Tables\CP_ALL_
models.rtf", label ///
title(Logistic Regression with cluster robust SE) ///
mtitles ("Empty" "FR" "All" "SlopesFR" "SlopesALL" "Context" "Interaction")
///
varwidth(50) compress ///
nogaps ///
se ///
nobaselevels ///
constant ///
nonumbers ///
addnote("Source: DEAS 2014") rtf replace
```

```
*with edu
esttab xtall xtallsl xtcon xtint using
"C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Tables\CP_ALL_
modelsedu.rtf", label ///
title(Multilevel) ///
mtitles ("M3" "M5" "M6" "M7") ///
varwidth(50) compress ///
nogaps ///
se ///
nobaselevels ///
constant ///
nonumbers ///
addnote("Source: DEAS 2014") rtf replace


**********************************************************************
                        Multilevel analysis CP
**********************************************************************
                        Random intercept
**********************************************************************

xtmelogit civilpartfin i.financap_d i.raumt2010lage_kreis_num ||
fiktiv_kreis_14: financap_d raumt2010lage_kreis_num,
covariance(unstructured) mle var
estimates store xtconfr //lr still significant
estat icc
*Between district variance financial exclusion

*in bars:
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d if
raumt2010lage_kreis_num==1 , covariance(unstructured) mle var
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d if
raumt2010lage_kreis_num==2 , covariance(unstructured) mle var
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d if
raumt2010lage_kreis_num==3 , covariance(unstructured) mle var
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d if
raumt2010lage_kreis_num==4 , covariance(unstructured) mle var
*M4

*1
dis (.054936)-((2*-.116277)*1)+((.2461109*1)^2) //.348
dis (.054936)-((2*-.116277)*0)+((.2461109*0)^2) //.0549
*2
dis .2413005-((2*-.285275)*1)+(.3372634*1)^2 //.9255
dis .2413005-((2*-.285275)*0)+(.3372634*0)^2 //.2413
*3
dis .3408641-((2*.0141889)*1)+(1.053988*1)^2 //1.423
dis .3408641-((2*.0141889)*0)+(1.053988*0)^2 //.3408
*4
dis .0566128-((2*-.1916087)*1)+(.6485085*1)^2 //.860
dis .0566128-((2*-.1916087)*0)+(.6485085*0)^2 //.0566

*M6
*1
dis .0305735-.2796082*1+(.6392866*1)^2 //.15965266
dis .0305735-.2796082*0+(.6392866*0)^2 //.0305735
*2
dis .2184296-.359001*1+(.1475095*1)^2 //-.11881235
dis .2184296-.359001*0+(.1475095*0)^2 //.2184296
*3
dis .3499733+.0472648*1+(1.071338*1)^2 //1.5450032
dis .3499733+.0472648*0+(1.071338*0)^2 //.3499733
```

```
*4
dis .0387709-.175988*1+(.1997105*1)^2 //-.09733282
dis .0387709-.175988*0+(.1997105*0)^2 //.0387709

**in slopes:

twoway function 0.166-.2896022*x+.5247306*x^2, range(0 1) ///
ytitle(District-level variance) xtitle(Exclusion from Financial Resouces)

xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d if
raumt2010lage_kreis_num==1 , covariance(unstructured) mle var
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d if
raumt2010lage_kreis_num==2 , covariance(unstructured) mle var
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d if
raumt2010lage_kreis_num==3 , covariance(unstructured) mle var
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d if
raumt2010lage_kreis_num==4 , covariance(unstructured) mle var
twoway ///
      function .0549362-.2325538*x+.2461096*x^2, range(0 1) ///
||    function .2412848-.5705036*x+.3372307*x^2, range(0 1) ///
||    function .3408641+.0283778*x+1.053988*x^2, range(0 1) ///
||    function .0566128-.383217*x+.6485079*x^2, range(0 1) ///
      ytitle(District-level variance) xtitle(Exclusion from Financial
Resouces) legend(label(1 "Very Central") label(2 "Central") label(3
"Peripheral")label(4 "Very Peripheral") position(3))

*Between district variance financial exclusion
twoway function 0.166-.2896022*x+.5247306*x^2, range(0 1) ///
ytitle(District-level variance) xtitle(Exclusion from Financial Resouces)

xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d
if raumt2010lage_kreis_num==1 , covariance(unstructured) mle var
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d
if raumt2010lage_kreis_num==2 , covariance(unstructured) mle var
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d
if raumt2010lage_kreis_num==3 , covariance(unstructured) mle var
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d
if raumt2010lage_kreis_num==4 , covariance(unstructured) mle var
twoway ///
      function .0305735-.2796082*x+.6392866*x^2, range(0 1) ///
||    function .2184296-.359001*x+.1475095*x^2, range(0 1) /// //not saved,
has to be replaced before submission
||    function .3499733+.0472648*x+1.071338*x^2, range(0 1) ///
||    function .0387709-.175988*x+.1997105*x^2, range(0 1) ///
      ytitle(District-level variance) xtitle(Exclusion from Financial
Resouces) legend(label(1 "Very Central") label(2 "Central") label(3
"Peripheral")label(4 "Very Peripheral") position(3))

xtmelogit civilpartfin i.raumt2010lage_kreis_num##i.financap_d ||
fiktiv_kreis_14: financap_d raumt2010lage_kreis_num,
covariance(unstructured) mle var
xtmelogit civilpartfin i.raumt2010lage_kreis_num##i.financap_d ||
fiktiv_kreis_14: financap_d raumt2010lage_kreis_num,
covariance(unstructured) mle var difficult
xtmelogit civilpartfin i.financap_d i.raumt2010lage_kreis_num ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var
margins, at(raumt2010lage_kreis_num=(1,2,3,4) financap_d=(0,1)) vsquish
```

```
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)
estat icc
xtmelogit civilpartfin i.raumt2010lage_kreis_num##i.financap_d ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var difficult
margins, at(raumt2010lage_kreis_num=(1,4) financap_d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)

xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d
i.raumt2010lage_kreis_num i.sex c.health c.agesq i.partnerhh c.nrhh i.edu4
i.socialrel_new_lonely_3d#i.raumt2010lage_kreis_num
i.financap_d#i.raumt2010lage_kreis_num|| fiktiv_kreis_14: financap_d,
covariance(unstructured) mle var difficult
margins, at(raumt2010lage_kreis_num=(1,2,3,4)
socialrel_new_lonely_3d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)

xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d
i.raumt2010lage_kreis_num i.sex c.health c.agesq i.partnerhh c.nrhh i.edu4
i.socialrel_new_lonely_3d#i.financap_d#i.raumt2010lage_kreis_num ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var difficult or
estimates store int3 //lr still significant
estat icc
esttab int3 using
"C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Tables\CP_int3
.rtf", label ///
title(Multilevel) ///
mtitles ("Mint3") ///
varwidth(50) compress ///
nogaps ///
se ///
nobaselevels ///
eform ///
constant ///
nonumbers ///
addnote("Source: DEAS 2014") rtf replace
margins, at(raumt2010lage_kreis_num=(1,2,3,4) socialrel_new_lonely_3d=(0,1)
financap_d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)

xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d
i.raumt2010lage_kreis_num i.sex c.health c.agesq i.partnerhh c.nrhh i.edu4
i.socialrel_new_lonely_3d#i.financap_d#i.raumt2010lage_kreis_num ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var difficult or
estimates store 3intor //lr still significant
estat icc
margins, at(raumt2010lage_kreis_num=(1,2,3,4) socialrel_new_lonely_3d=(0,1)
financap_d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)

xtmelogit civilpartfin i.socialrel_new_lonely_3d i.sex c.health c.agesq
i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num##financap_d ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var
```

```
margins, at(raumt2010lage_kreis_num=(1,2,3,4) financap_d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation) legend(position(3))
graph export "E:\01_Master Thesis\interaction_full_model.png", as(png)
replace

margins, dydx(*)
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)
margins, dydx(raumt2010lage_kreis_num financap_d) atmeans
marginsplot, nolabels title(Income effect by area on Civil Participation)
///
ytitle(Civil Participation)


*********************************************************************
                        Multilevel analysis SR
*********************************************************************
                        Random intercept
*********************************************************************

*********
**Empty**
*********
xtmelogit socialrel_new_lonely_3d || fiktiv_kreis_14:,
covariance(unstructured) mle var
estimates store xtemp1 //lrtest significant
//VPC/ICC
display .1237933/(.1237933+3.29) //= 4% of the residual variation in the
propensity to be civially excluded is attributable to unobservable district
characteristics
estat icc
******
**FR**
******
xtmelogit socialrel_new_lonely_3d i.financap_d || fiktiv_kreis_14:,
covariance(unstructured) mle var
estimates store xtfr1 //lr also significant
//few change in between variance --> IV similar across districts
estat icc

******
**All*
******
xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: ,
covariance(unstructured) mle var
estimates store xtall1 //lr still significant
estat icc

*********************************************************************
                        Multilevel analysis SR
*********************************************************************
                        Random intercept + random coef.
*********************************************************************

******
**FR**
******
```

```
xtmelogit socialrel_new_lonely_3d i.financap_d || fiktiv_kreis_14:
financap_d, covariance(unstructured) mle var
estimates store xtfrsl1 //lr also significant
estat icc
predict predprob17
gen predlogit17 = logit(predprob17)
egen pickone17 = tag(fiktiv_kreis_14 financap_d)
gen multifin17 = pickone17
bys fiktiv_kreis_14 (financap_d): replace multifin17 = 0 if
financap_d[_N]==financap_d[1]
twoway connected predlogit17 financap_d if pickone17==1 & multifin17==1,
connect(ascending) ///
ytitle(Predicted log-odds) xtitle(Exclusion from Financial Resouces)
sum predlogit17 if financap_d==0 // predlogit between -2.352258 and -
1.369354
display exp(-2.352258)/[1+exp(-2.352258)] //..08688646
display exp(-1.369354)/[1+exp(-1.369354)] //.20272424
sum predlogit if financap_d==1 //predlogit between -2.062157 and -.144943
display exp(-2.062157)/[1+exp(-2.062157)] //.11282974
display exp(-.144943)/[1+exp(-.144943)] //.46382756
******
**All*
******
xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d,
covariance(unstructured) mle var
estimates store xtallsl1 //lr still significant
estat icc

*********************************************************************
                        Multilevel analysis SR
*********************************************************************
                        Contextual Effects
*********************************************************************

xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var
estimates store xtcon1 //lr still significant
estat icc
*urban
xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.ktyp4_num || fiktiv_kreis_14:
financap_d, covariance(unstructured) mle var
estimates store xtcon1 //lr still significant
estat icc

********************
*****Interaction****
********************
xtmelogit socialrel_new_lonely_3d i.civilpartfin i.sex c.health c.agesq
i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num##financap_d ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var
estimates store xtint1 //lr still significant
margins, at(raumt2010lage_kreis_num=(1,2,3,4) financap_d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Social Relations)
legend(position(3)) ///
ytitle(Social Relations)

xtmelogit socialrel_new_lonely_3d i.raumt2010lage_kreis_num##financap_d ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var
estimates store xtint2 //lr still significant
```

```
margins, at(raumt2010lage_kreis_num=(1,2,3,4) financap_d=(0,1)) vsquish
marginsplot, nolabels title(Income effect by area on Social Relations)
legend(position(3)) ///
ytitle(Social Relations)

estat icc
esttab xtemp1 xtfr1 xtall1 xtfrsl1 xtallsl1 xtcon1 xtint1 using
"C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Tables\SR_ALL_
models.rtf", label ///
title(Logistic Regression with cluster robust SE) ///
mtitles ("Empty" "FR" "All" "SlopesFR" "SlopesALL" "Context" "Interaction")
///
varwidth(50) compress ///
nogaps ///
se ///
nobaselevels ///
constant ///
nonumbers ///
addnote("Source: DEAS 2014") rtf replace

predict predprob14
gen predlogit14 = logit(predprob14)
egen pickone14 = tag(fiktiv_kreis_14 financap_d)
gen multifin14 = pickone14
bys fiktiv_kreis_14 (financap_d): replace multifin14 = 0 if
financap_d[_N]==financap_d[1]
line predlogit14 financap_d if multifin14==1, connect(ascending)
twoway connected predlogit14 financap_d if multifin14==1,
connect(ascending) ///
ytitle(Predicted log-odds) xtitle(Exclusion from Financial Resouces)
sum predlogit14 if financap_d==1 // predlogit between -2.602592 and 1.63811
display exp(-2.602592)/[1+exp(-2.602592)] //.06897179
display exp(1.63811)/[1+exp(1.63811)] //.8372776
*Between district variance financial exclusion
twoway function 0.196 -0.302*x+0.542*x^2, range(0 1) ///
ytitle(District-level variance) xtitle(Exclusion from Financial Resouces)

xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num ||
fiktiv_kreis_14:, covariance(unstructured) mle var
estimates store test2
predict predprob15
gen predlogit15 = logit(predprob15)
egen pickone15 = tag(fiktiv_kreis_14 financap_d)
gen multifin15 = pickone15
bys fiktiv_kreis_14 (financap_d): replace multifin15 = 0 if
financap_d[_N]==financap_d[1]
line predlogit15 financap_d if multifin15==1, connect(ascending)
twoway connected predlogit15 financap_d if multifin15==1,
connect(ascending) ///
ytitle(Predicted log-odds) xtitle(Exclusion from Financial Resouces)
sum predlogit14 if financap_d==1

xtmelogit socialrel_new_lonely_3d i.financap_d || fiktiv_kreis_14:
financap_d if raumt2010lage_kreis_num==1 , covariance(unstructured) mle var
xtmelogit socialrel_new_lonely_3d i.financap_d || fiktiv_kreis_14:
financap_d if raumt2010lage_kreis_num==2 , covariance(unstructured) mle var
xtmelogit socialrel_new_lonely_3d i.financap_d || fiktiv_kreis_14:
financap_d if raumt2010lage_kreis_num==3 , covariance(unstructured) mle var
xtmelogit socialrel_new_lonely_3d i.financap_d || fiktiv_kreis_14:
financap_d if raumt2010lage_kreis_num==4 , covariance(unstructured) mle var
twoway ///
```

```
      function .0305735-.2796082*x+.6392866*x^2, range(0 1) ///
||    function .2184296-.359001*x+.1475095*x^2, range(0 1) /// //not saved,
has to be replaced before submission
||    function .3499733+.0472648*x+1.071338*x^2, range(0 1) ///
||    function .0387709-.175988*x+.1997105*x^2, range(0 1) ///
      ytitle(District-level variance) xtitle(Exclusion from Financial
Resouces) legend(label(1 "Very Central") label(2 "Central") label(3
"Peripheral")label(4 "Very Peripheral") position(3))

xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d
if raumt2010lage_kreis_num==1 , covariance(unstructured) mle var
xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d
if raumt2010lage_kreis_num==2 , covariance(unstructured) mle var
xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d
if raumt2010lage_kreis_num==3 , covariance(unstructured) mle var
xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d
if raumt2010lage_kreis_num==4 , covariance(unstructured) mle var
twoway ///
      function .1324581-.3544152*x+.4679809*x^2, range(0 1) ///
||    function .0307866+.1463002*x+.173807*x^2, range(0 1) /// //not saved,
has to be replaced before submission
||    function .36353-.4171602*x+.6339807*x^2, range(0 1) ///
||    function .1220954+.913635*x+10.709194*x^2, range(0 1) ///
      ytitle(District-level variance) xtitle(Exclusion from Financial
Resouces) legend(label(1 "Very Central") label(2 "Central") label(3
"Peripheral")label(4 "Very Peripheral") position(3))
dis 2*-.1772076
dis 2*.0731501
dis 2*-.2085801
dis 2*.4568175

*M5
xtmelogit socialrel_new_lonely_3d i.financap_d##i.raumt2010lage_kreis_num
|| fiktiv_kreis_14: financap_d, covariance(unstructured) mle var
estimates store M5 //lr still significant
esttab M5 using
"C:\Users\leafo\OneDrive\Dokumente\Master\3\2a\Master_Thesis\Tables\SR_m5.r
tf", label ///
title(Logistic Regression with cluster robust SE) ///
mtitles ("M5") ///
varwidth(50) compress ///
nogaps ///
se ///
nobaselevels ///
constant ///
nonumbers ///
addnote("Source: DEAS 2014") rtf replace

*Plot from Lindström  --> too few obs
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14:,
covariance(unstructured) mle var or
estimates store xtfr //lr also significant
//some change in between variance --> IV not similar across districts
//some disricts may be wealthier than others
estat icc
correlate civilpartfin financap_d, covariance
sum civilpartfin
egen bcp = e(b)
```

```
bys fiktiv_kreis_14: egen fr = mean(financap_d)
egen sfr = std(fr)

*indicator whether no variance
egen equal = max(civilpartfin), by(fiktiv_kreis_14)
egen equal1 = max(financap_d), by(fiktiv_kreis_14)
bysort fiktiv_kreis_14:

levelsof fiktiv_kreis_14 if equal==1 | equal1==1, local(lev)

foreach i of local lev {
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: if fiktiv_kreis_14
== `i' & equal!=0 & equal1!=0, covariance(unstructured) mle var
    estimates store perf`i'
}

estimates dir

bys fiktiv_kreis_14: egen cp = mean(civilpartfin)
egen scp = std(cp)
twoway scatter sfr scp

*M7 signifikanz slope
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var
est store model11

xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num ||
fiktiv_kreis_14:, covariance(unstructured) mle var
est store model12
predict predprob20,fixedonly
graph bar (mean) predprob20, over(raumt2010lage_kreis_num)

xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num ||
fiktiv_kreis_14: financap_d, covariance(unstructured) mle var
est store model21

xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 i.raumt2010lage_kreis_num ||
fiktiv_kreis_14:, covariance(unstructured) mle var
est store model22
predict predprob21,fixedonly
graph bar (mean) predprob21, over(raumt2010lage_kreis_num)

lrtest model11 model12 //random effect for financial exclusion not
significant in model CP
lrtest model21 model22 //random effect for financial exclusion not
significant in model Sr

esttab model11 model12 model21 model22 using "D:\01_Master
Thesis\m7_7.rtf", label ///
title(Logistic Regression with cluster robust SE) ///
mtitles ("CP M7" "CP M7.1" "SR M7" "SR M7.1") ///
varwidth(50) compress ///
nogaps ///
se ///
nobaselevels ///
constant ///
nonumbers ///
```

```
addnote("Source: DEAS 2014") rtf replace

xtmelogit civilpartfin || fiktiv_kreis_14:, covariance(unstructured) mle
var

*M4 sig slope
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14: financap_d,
covariance(unstructured) mle var
est store m11
xtmelogit civilpartfin i.financap_d || fiktiv_kreis_14:,
covariance(unstructured) mle var
est store m12
lrtest m11 m12 // random effect for financial exclusion significant in
model CP
xtmelogit socialrel_new_lonely_3d i.financap_d || fiktiv_kreis_14:
financap_d, covariance(unstructured) mle var
est store m111
xtmelogit socialrel_new_lonely_3d i.financap_d || fiktiv_kreis_14:,
covariance(unstructured) mle var
est store m121
lrtest m111 m121 // random effect for financial exclusion significant in
model sr

*M6 sig slope
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d,
covariance(unstructured) mle var
est store m3
xtmelogit civilpartfin i.financap_d i.socialrel_new_lonely_3d i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14:,
covariance(unstructured) mle var
est store m4
xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14: financap_d,
covariance(unstructured) mle var
est store m5
xtmelogit socialrel_new_lonely_3d i.financap_d i.civilpartfin i.sex
c.health c.agesq i.partnerhh c.nrhh i.edu4 || fiktiv_kreis_14:,
covariance(unstructured) mle var
est store m6

lrtest m3 m4
lrtest m5 m6

*Coefficients M7 CP
dis 0.141-(2*-0.083*1)+(0.354*1)^2 //.432
dis 0.141-(2*-0.083*0)+(0.354*0)^2 //.141
```