

Dissertation

Econometric Essays on Population Economics: Retirement, Fertility, Sexuality

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Preface

Die vorliegende Dissertation ist gemäß den Vorgaben der Promotionsordnung des Fachbereichs IV „Wirtschafts- und Sozialwissenschaften, Mathematik, Informatik und Wirtschaftsinformatik“ der Universität Trier vom 28.09.2004 angefertigt worden. Die Einleitung fasst die Kapitel 1 bis 3 inhaltlich zusammen, ordnet die Ergebnisse dieser Dissertation in den aktuellen Stand der Wissenschaft ein und stellt den inneren Zusammenhang sowie die wesentlichen Schlussfolgerungen der nachfolgenden Kapitel dar. Gemäß § 5, Absatz (4) der Promotionsordnung befindet sich eine deutsche Zusammenfassung am Ende der Dissertation.

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Introduction

Population economics deals with the analysis of health, education and labour, as well as with demographics such as marriage, fertility, family, ageing, retirement or mortality. Whole strands of research emerge from each topic in itself, but they become particularly exciting as they are interrelated. This dissertation focuses on three chapters from the field of population economics. The first chapter is concerned with the aging population and well-being at work. As individuals get older, they increasingly think about retirement. Health status, of course, is a constraint for labour supply. However, in addition to health conditions, interpersonal conflicts shape the well-being at work and the desire of some to quit. Another interesting research topic is that of young women at the transition between adolescence and adulthood, which is the subject of the second chapter. Childhood and adolescence are markedly shaped by the parents' educational style. Through the interaction between parents and children, values and norms such as religious norms, for example, can transmit to the sexual, contraceptive and fertility behaviour of young women. The third chapter recognizes sexuality as an important partnership issue and looks at the relevance of personality, gender differences and communication.

Each chapter of this dissertation implies economic relevance. Interpersonal conflict at the workplace has an impact on a wide set of outcomes such as performance, output (e.g. from Barki/Hartwick 2004) as well as health (e.g. Romanov et al. 1996), burn-out, turnover (e.g. Jaramillo et al. 2011, De Dreu/Weingart 2003) and retirement intentions. As retirement entry shifts labour supply of experienced workers to zero, this issue is particularly relevant for employers as well as policymakers who are in charge of the design of the pension system. Giving birth has comprehensive economic relevance for young women. Direct monetary income losses occur during parental leave, unpaid parental leave and subsequent part-time work (e.g. Blau/Kahn 2017, Jacobson et al. 1999, Kravdal 1992, Joshi 1990). Due to the lower level of employment, work experience remains lower, further training is attended less frequently and career opportunities are lost, which all result in indirect income losses (e.g. Blau/Kahn 2017, Barron et al. 1993, Altonji/Spletzer 1991, Mincer/Polachek 1974). The economic relevance of sexuality becomes apparent at second glance. Sexuality has decisive influence on the quality of partnerships, subjective well-being and happiness (e.g. Schmiedeberg et al. 2017, Wadsworth 2014, Elmslie/Tebaldi 2014, Blanchflower/Oswald 2004). Well-being and happiness, in turn, are significant key determinants not only in private life but also in the work domain, for example in the area of job performance (Oswald et al. 2015). Furthermore, partnership quality has immediate influence on how long a partnership lasts and thus on partnership

status which in turn is of economic relevance, as financial opportunities of partners and spouses are more prosperous than of that singles.

The three chapters of this dissertation depart from standard economic theory on decision-making under cost-benefit analysis and utility functions. Agents – employees, women, partners – interact in order to achieve a situation in which costs and benefits are equilibrated and own utility – from retiring, fertility behaviour or sex – is maximized, showing that economic theory may be applied to more general settings. The penetration of economic models into new disciplines like fertility or sexual behaviour is a newly emerging strand of research (e.g. Lazear 2000, Borghans et al. 2008). However, the chapters of the present dissertation do not ignore that decision-making takes place in a social context. Concepts from sociology and psychology are applied to economic models (e.g. Lazear 2000, Lundberg 2011, Gabaix 2014, Thaler 2016) and help to explain human behaviour where standard economic models reach their limit. One may argue that utility functions express non-monetary tastes and preferences. Huettel and Kranton (2012), for example, trace these preferences back to people's identities and social norms for behaviour in different social contexts. Further on, Khalil (2017) provides ideas on how social norms emerge and whether society determines social norms to which individuals adhere after a rational choice process or whether social norms emerge as a result of rational choice. Chong (1996) analyses the interaction of (social) values and (economic) interests and how they help to predict human behaviour. Recently, and with the help of large datasets, it has become easier to uncover behavioural anomalies from standard economic predictions (Chetty 2015). Various authors point to the relation between cognitive ability and behavioural biases (e.g. Benjamin et al. 2013, Becker et al. 2012, Jagelka 2020). However, besides cognition, personality traits seem to be important constraints on human behaviour that in the end shapes conventional economic preference parameters (Borghans et al. 2008). Personality traits may be also useful to explain demographic outcomes like sexual and marriage behaviour or fertility (Lundberg 2011). As research benefits from a multidisciplinary approach, this will be a crucial part of the dissertation's chapters.

The first chapter of this dissertation on interpersonal conflict and retiring intentions raises the idea that there is more than economic reasoning in human behaviour. Certainly, the probability of retirement entry is linked to an individual's economic circumstances and health status. However, decision-making takes place in a social context. Thus, interpersonal conflict with the boss may be relevant in making retirement decisions. Interpersonal conflict may be viewed as the combination of disagreement, negative emotion and interference (Barki/Hartwick 2004). It is a dynamic process that occurs between interdependent parties, such as employer and employee. The conflict may arise from

disagreement on the task or from disagreement with the other's personal values, views or preferences. The disagreement is combined with negative emotions like anger and frustration. Quitting the situation by entering into retirement earlier is one possible solution of the conflict. The second chapter on religion and fertility focuses on the relevance of social norms. An interesting meta-analysis by Steel et al. (2018) on subjective well-being revealed that culture (i.e. shared and relatively stable values) certainly matters. Social values, e.g. freedom, charity, protecting life or helpfulness, are a set of moral principles that form a legitimizing basis for human behaviour. If they are applied to a specific situation, e.g. pregnancy, the values may transform into social norms that serve the fine-tuning of social behaviour. Disobedience means sanctions (Hillmann 2017, Wiswede 2017). Norms are manifested in multiple spheres of life like personal relationships, families, churches, and schools. Some are even backed by the force of legal authority (Chong 1996), e.g. abortions laws. The second chapter shows that religion as a social norm may extensively influence decision-making in fertility behaviour. From a rational choice perspective, Chong (1996) reckons that people eventually change their values when it is no longer beneficial to continue conforming to them, for example when social conditions change. It is likely that changing values and norms will be powerful enough to translate into changing fertility behaviour. Finally, norm-guided behaviour is distinct from behaviour shaped by personality. The third chapter of this dissertation highlights the power of personality in one major partnership domain: sexuality. At the beginning of the research work on sexuality, the focus was on the influence of employment, religion as well as East and West German differences. They indeed play a role. However, after incorporating personality traits as controls, the substantial model improvement shifted the focus from labour and social variables to psychological determinants, confirming the idea of Lundberg (2011) that personality traits may do a good job in explaining demographic outcomes.

The chapters are connected by the two important concepts of gender and relationship status. Across a variety of outcomes, gender marks profound differences and the debate on what fraction of these differences should be traced back to institutions, to socialisation or to genetics is ongoing (e.g. Goldin 1990, Guiso et al. 2008, Gneezy et al. 2009). The first chapter on retirement intentions shows that there is a decisive gender impact for the timing of retirement, and the third chapter reveals that sexuality of men and women seems to be moderated by asymmetric gender roles and a sexual double standard. Decision-making in relation to contraception and the consequences of pregnancy are largely borne by the women themselves. Thus, the second chapter on the transmission of religious values and fertility behaviour is focused on women exclusively. All three chapters integrate the relationship status of a person as an important determinant of economic decisions as well as for sexual and contraceptive behaviour. Being single, in partnership or being married has implications on

how much time is offered on the labour market, for example when it comes to retirement decisions as being discussed in chapter one. Contraceptive behaviour – particularly decisions on the timing of first birth – is strongly related to whether being in a partnership or being single which is the issue in chapter two. Chapter three reveals the substantial role of relationship duration and the institution of marriage for sexuality.

The data used in this dissertation derives from two large and representative population surveys, namely the Socio-Economic Panel (SOEP) and the German Panel Analysis of Intimate Relationships and Family Dynamics (pairfam). Both datasets provide information on human behaviour at the individual level and qualify particularly well to explore research questions in population economics. The SOEP suits well for the analysis on social phenomenon in the labour domain as is the topic in the first chapter on interpersonal conflict and retirement. Pairfam is a unique source of information on family and partnership issues and is a smart dataset for the second and third chapter on fertility and sexuality. These large and representative datasets enable more sophisticated statistical techniques than would have been possible in clinical studies of small sample size.

All chapters use random-effects estimations which allow the incorporation of time-constant determinants into the analysis while simultaneously accounting for the longitudinal nature of the data. In addition, the analysis of information on competing fertility events (miscarriage, abortion, live birth) in chapter two and on desired frequency of intercourse (same, less, more) in chapter three is considered by applying multinomial logit models. As health determinants may not only yield direct effects but also indirect effects on retirement intentions, the first chapter models the moderating role of health and interpersonal conflicts via an interaction effect.

The contribution of this dissertation emerges from the integration of social and psychological concepts into economic analysis as well as the application of economic theory in non-standard economic research topics. The results of the three chapters show that the multidisciplinary approach yields better prediction of human behaviour than the single disciplines on their own. The results in the first chapter show that both interpersonal conflict with superiors and the individual's health status play a significant role in retirement decisions. The chapter further contributes to existing literature by showing the moderating role of health within the retirement decision-making: On the one hand, all employees are more likely to retire when they are having conflicts with their superior. On the other hand, among healthy employees, the same conflict raises retirement intentions even more. That means good health is a necessary, but not a sufficient condition for continued working. It may be that conflicts with superiors raise retirement intentions more if the worker is healthy. The key findings of the second chapter reveal significant influence of religion on contraceptive and

fertility-related decisions. A large part of research on religion and fertility is originated in evidence from the US. This chapter contrasts evidence from Germany. Additionally, the chapter contributes by integrating miscarriages and abortions, rather than limiting the analysis to births and it gains from rich prospective data on fertility biography of women. The third chapter provides theoretical insights on how to incorporate psychological variables into an economic framework which aims to analyse sexual well-being. According to this theory, personality may play a dual role by shaping a person's preferences for sex as well as the person's behaviour in a sexual relationship. Results of econometric analysis reveal detrimental effects of neuroticism on sexual well-being while conscientiousness seems to create a win-win situation for a couple. Extraversions and Openness have ambiguous effects on romantic relationships by enhancing sexual well-being on the one hand but raising commitment problems on the other. Agreeable persons seem to gain sexual satisfaction even if they perform worse in sexual communication.

1 Retirement Intentions: The Role of Conflict with the Boss and Health

Abstract: This paper explores the retirement intentions of employees and the factors that influence those intentions. Conflicts between employees and their superiors, as well as the role health plays in this conflict, were analysed using Socio-Economic Panel (SOEP) data. The results showed that both conflicts and individual's health status play a role in retirement decisions. Conflict with superiors is significantly associated with the intent to retire after accounting for control variables. Similarly, employees in poor or bad health are more likely to retire. Furthermore, health plays a moderating role: Employees in poor or bad health are likely to express retirement intentions, whereas conflict only slightly raises intention. Retirement intentions of healthy employees, however, rise steeply if there are conflicts with superiors. This suggests that healthy people may well be able to continue to work, but not necessarily do so because conflict with superiors has a greater impact on their retirement decisions than for unhealthy people.

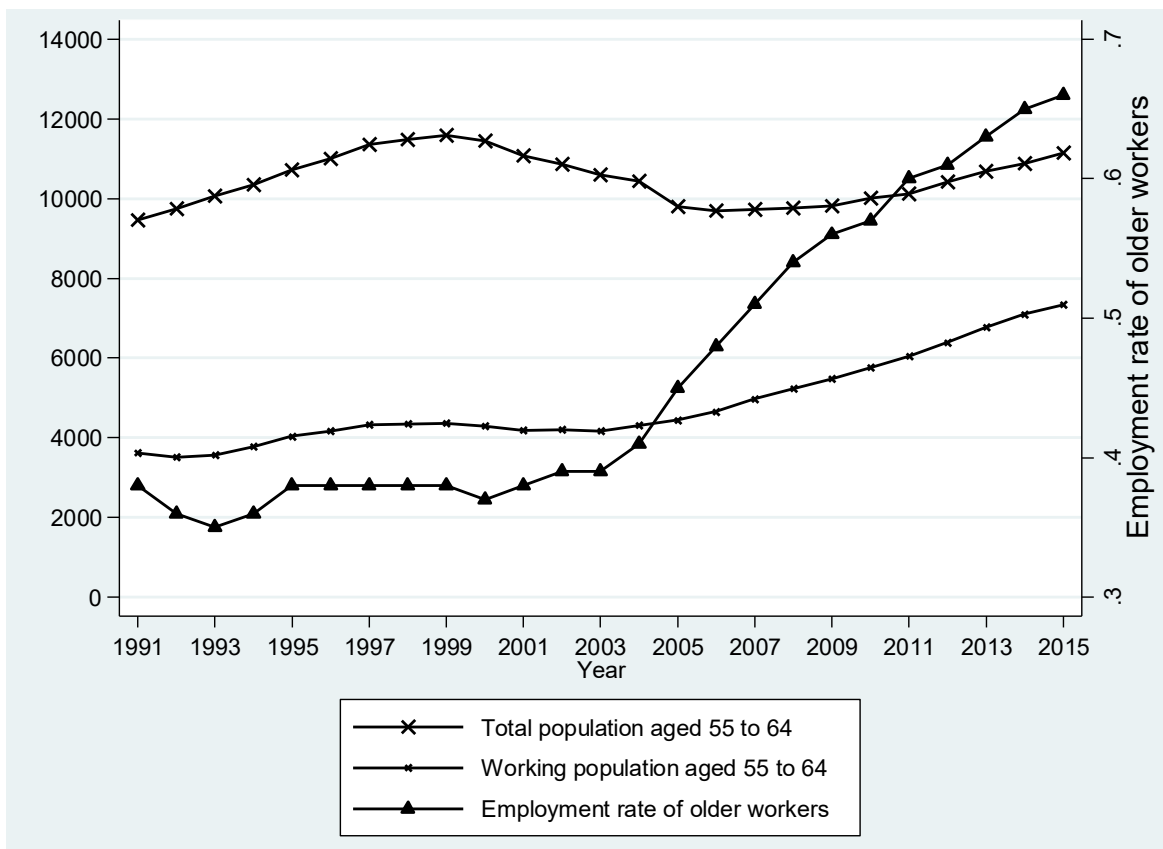
Keywords conflicts with superiors, retirement intentions, health status, moderating role of health, older employees

JEL J26, I10, M54

1.1 Introduction

The share of older employees in the German workforce has been increasing throughout the '00s up to the present. Overall employment rates of older workers aged 55 to 64 have risen from 37 percent in 2000 to nearly 50 percent in 2006, reaching 66 percent in 2015 (see Figure 1-1).

Figure 1-1 Total population, working population and employment rate of individuals aged 55 to 64 in Germany



Source: German federal bureau of statistics 2017; own calculations.

Employment rates among older workers are particularly pronounced in specific sectors and certain regions in Germany: some firms face a huge share of older employees in their workforce. Once this working population retires, a labour shortage may emerge. Policy makers have discussed several approaches to this impending labour shortage, including adjusting the legal retirement age, educating youth, or encouraging women and foreigners to fill the gap. One largely ignored potential solution, however, is to encourage older employees to remain in the workforce for a longer period. Older employees are usually more experienced than young employees and constitute an important resource of experience and knowledge.

This paper focuses on the retirement decision of older employees. Apart from the obvious financial determinants of retirement, there may be relevant social factors. A good working atmosphere is important for older workers and conflicts with superiors may play a decisive role in retirement intentions.

Good relations at work are usually associated with higher job satisfaction, higher employee motivation, and higher productivity. In contrast, conflicts at work are associated to lower performance, less health and decreased job tenure.

Moreover, conflicts with superiors may be particularly important for older employees. Older employees report higher life satisfaction if social support is reciprocal, give priority to emotional goal, and are more likely to maintain emotionally meaningful relationships than potentially problematic ones.

Retirement may be a response to conflicts at work among older employees. The intent to retire is compared to actual retirement of special interest to this paper. The focus of this paper is on the *intent* to retire because intentions are connected to the individual's engagement with work and it therefore carries particular meaning for management.

Health status is certainly an important influencing factor in retirement deliberations. However, it is a necessary, but not a sufficient condition to continue working. Can health status interact with conflicts at work, i.e., deteriorate or alleviate the effects of such conflicts? Do conflicts with superiors and health status interact to influence decisions to retire?

Previous papers focus on broad concepts, such as work quality, rather than on conflicts with superiors (Siegrist et al. 2006; Siegrist/Wahrendorf 2009). Other investigations focus on interpersonal conflicts and their influences on health, work disability or occupational mobility, omitting possible influences on early voluntary retirement (De Raeve et al. 2009; Appelberg et al. 1996). The contribution of this paper is twofold: First, it analyses the effect that conflicts with superiors can have on the retiring intentions of older workers. Second, it takes into account a possible interaction of health and conflict.

This paper is structured as follows. Section 2 provides the relevant background discussion and findings of previous research. It also derives theoretical predictions for conflicts with the superior and health status. Section 3 introduces the dataset and variables used in the analysis. Section 4 presents the empirical findings of the regression analysis. Section 5 and 6 conclude.

1.2 Background Discussion and Previous Research

1.2.1 Conflicts with Superiors

Good relations with colleagues and superiors are strong determinants for job satisfaction (Winstead et al. 1995; Van Praag/Ferrer-i-Carbonell 2004; Cornelißen 2009). Lazear et al. (2015) reveal that good superiors make employees more productive and reduce worker turnover. Conflicts at work are not always critical, but when they are, they frequently devolve into negative consequences. Conflicts may reduce employees' motivation to work (Bergmann/Volkema 1994) and have influence on job attitudes. Jaramillo et al. (2011) show that interpersonal conflicts lead to altered attitudes towards the job, which in turn results in lower performance and higher turnover intentions. Conflicts at work negatively affect health (Bergmann/Volkema 1994) and are significantly associated with increased psychiatric morbidity (Romanov et al. 1996).

In addition, social relationships at work may have greater impact on older than younger individuals. In a study on social support, Antonucci et al. (1990) focus on older individuals and find out that if social support is reciprocal – i.e., older individuals receive as much support from others as they provide to them – they report greater life satisfaction. Moreover, social relationships vary over the lifespan. Older people have fewer friends, but still have the same number of very close relationships as their younger counterparts (Carstensen et al. 2003). According to the Socioemotional Selectivity Theory, individuals seek social partners consistent with their broader goals. To older people, emotional goals have priority (Carstensen et al. 1999) and they rather maintain emotionally meaningful relationships than potentially problematic ones (Carstensen et al. 2003). Due to the shorter life-time horizon, older employees may be more likely to dissolve burdensome relationships. Therefore, conflicts with superiors may trigger older employees to leave the job to seek for retirement. In a study of workers with good health, Heywood et al. (2005) report that older workers are more likely to experience conflicts with their superiors. This suggests that conflicts with superiors may be of particular importance for the elderly of the workforce. Conflicts with superiors have been analysed in several studies (Appelberg et al. 1996; De Raeve et al. 2008), but few have explicitly examined older workers facing retirement.

1.2.2 Retirement Decision

A simple life-time retirement model assumes the retirement decision to be a worker's issue to maximise his utility of leisure and expenditures on goods subject to the budget constraint (Lazear 1986). Further development of that model was made by Stock and Wise (1990) whose more complex option value model considers that the retirement decision is usually irreversible. According to their

option value model, a person will continue to work at any age if the expected present value of continuing work is greater than the expected present value of immediate retirement. In addition, a person reevaluates this retirement decision as more information about future earnings – and thus future retirement benefits – becomes available with age. Interpersonal conflicts at work appear to decrease one's expected present value of continued working and raise one's expected present value of immediate retirement. Conflicts with superiors create an unpleasant atmosphere that the employee cannot avoid as long as he or she is working every day. Because contact with one's superior is sharply reduced after retirement, the unpleasant, conflict-ridden atmosphere is likely to disappear. Therefore, for an employee experiencing conflicts with the superior, his or her value of immediate retirement may be increased compared to the value of continued work.

For a profound understanding of early retirement, Feldman (1994) suggests a decision-tree framework in which the worker undergoes a four-staged consideration process until he or she reaches permanent retirement. Every stage of this decision-tree may be influenced by a set of individual differences, opportunity structures, organizational factors, and external factors. Conflicts with superiors are a specific negative characteristic of the firm and according to this framework, this may impose opportunity structures that induce the worker to leave a job.

Retrospectively, retirees assign importance to conflicts when they decided to withdraw from the workforce: in a qualitative survey, older Dutch employees (aged 60-64 years) who had retired early were asked about their reasons for having done so. Conflict at work was included among reasons for leaving the workforce early (Reeuwijk et al. 2013). Further evidence is provided by the analysis of quasi-experimental and time-series data. A Finnish twin cohort study revealed an elevated likelihood to claim work disability pension for women who experienced interpersonal conflict at work (Appelberg et al. 1996). Blanchard-Fields et al. (2007) discovered that older people who face interpersonal conflicts rather use emotion-focused strategies. These strategies include cognitive avoidance or efforts to withdraw from the situation that provoked the conflict. Lund and Villadsen (2005) conducted a representative longitudinal survey among Danish employees aged 57-62 years in order to detect determinants of early retirement. Conflict at work was one among several work environment factors.

Thus, retiring may be an option when conflicts at work persist. The theoretical considerations lead to the assumption that conflicts with superiors influence a worker's decision to retire. Conflicts generate an unpleasant atmosphere or even psychological strain that compel workers to expedite their time of retirement (baseline hypothesis H1). This paper considers whether the results from the Dutch, Finnish and Danish workforce hold true for Germany as well.

In order to capture an employee's retirement decision, this paper relies on the self-reported intentions of an employee to retire. Retirement intentions can be tentative and may still be influenced by unexpected events in the future. Nevertheless, retirement intentions not only influence labour supply but also investments in continued training and engagement to work.

First, retiring intentions serve as an indicator for the likelihood of actual retirement. Theoretical considerations to link retirement plans to retirement behavior found on the attitude-behavior theory of Ajzen and Fishbein (1974). Their theory describes the correlation between behavioral intentions and behavior. Liska (1984) and Bagozzi (1992) add considerable aspects and refine the attitude-behavior theory. Empirical evidence provide Burkhauser and Quinn (1985) who analyse the factors driving the accuracy of retirement plans using data from Retirement History Study (RHS) from 1969-1979. The most significant factor is the number of years between the moment of being surveyed and the planned retirement year. Anderson, Burkhauser and Quinn (1986) found out that retirement plans of workers were inaccurate in 40 percent of the time, partly due to unexpected changes in the determining variables. An analysis of Prothero and Beach (1984) found that, over a two-year period, actual retirement was correctly predicted to 76 percent of the time, given intentions to retire. Henkens and Tazelaar (1997) reason that behavioral intentions can be considered as good predictors of actions if they concern a specific behavior in a restricted time span in which individuals have a great freedom of choice. Results by Benitez-Silva and Dwyer (2005) also support models that assume retirement intentions as consistent with rational behavior.

Second, intended retirement seems connected to the probability of continued training. Workers with high intended retirement age show also high probability of skill updating (Messe et al. 2014). Investments into continued training may be higher if the time of retirement is likely to be in distant future.

Third, retiring intentions may reflect an employee's motivation to work and are thus of special interest for the management. Richer et al. (2002) test a motivational model of work turnover. Their findings from a survey-based study indicate that work motivation is negatively associated with emotional exhaustion and positively associated with work satisfaction. Further results show that the more emotionally exhausted an individual is and the less satisfied he or she is at work, the more likely he or she will be to intend to leave the job. A meta-analysis reveals that organizational commitment leads to fewer intentions to search for job alternatives as well as to leave one's job (Mathieu/Zajac 1990).

1.2.3 The Moderating Effect of Health Status

Among the determining factors affecting retirement decisions, the worker's health status is certainly one of most prominent. Vast research underscores the importance of an individual's health status in the decision about whether to stay in the labour force (Van den Berg et al. 2010; De Preter et al. 2012; Hochman/Lewin-Epstein 2013 or Radl 2013 to list some recent analysis). The health effect is more important than other covariates. By means of combined survey and administrative data on nurses, Friis et al. (2007) find out that poor self-rated health has a stronger influence to retire early than work-related factors; poor working conditions only marginally increased the probability of retiring early. Among a wide set of covariates, health turns out to be the key determinant for early retirement (Roberts et al. 2010). Following these results, the health effect on retirement intentions should be negative: healthy workers show fewer intentions to retire (baseline hypothesis H2).

However, this paper argues that health status may also reveal an indirect effect on retirement intentions. Related to conflicts at work, health may also reveal an indirect effect on retirement intentions. Different health conditions may provoke means for dealing with the conflicts that occur at work. Being in good health may enable a worker to deal with severe conflicts at work well, whereas ill health may inhibit a worker from coping with that conflict. De Raeve et al. (2008) observe that conflicts with coworkers and superiors occur relatively more often among persons with a long-term illness. Poor health and conflicts at work seem to form a double burden, raising retirement intentions even more. Conversely, one may argue that a good state of health is a necessary, but not a sufficient condition for continued working. Healthy people are able to continue working, but they not necessarily do so because other factors (e.g., social relationships at work) gain more importance. It may be that conflicts with superiors raise retirement intentions more if the worker is healthy.

These considerations raise the question of whether there is a moderating role of health status in the retirement deliberation process. And while there is much empirical evidence on the fact that an individual's health status influences retirement decisions, there is less evidence on a possible interaction between health status and conflicts within the retirement process. One exception is the work of Harkonmäki et al. (2006) who show that mental health influences the retirement decision, but its importance declines after adjustment for work and family-related factors. However, the authors failed to detect significant interactions between mental health and social network size, which is an indicator for social support. The present paper hypothesises a notable difference between workers of good and ill health with regard to an effect that conflicts can have in the retirement decision (H3).

1.3 Dataset and Variables

The paper uses individual-level data from the Socio-Economic Panel (SOEP). SOEP is a representative longitudinal study that started in 1984. Currently, about 30,000 people are interviewed across circa 11,000 households per year.

Corresponding information on conflict with work superiors is available in 1995, 2001, 2006 and 2011. Due to a lack of information on retirement intentions in 2006, corresponding information from 2007 is merged. More recent data on conflict with superior from 2011 and information on retiring intentions from 2013 are not included because of the relatively large two-year gap. Conflicts that had been reported in 2011 may no longer persist in 2013, when retirement intentions are indicated. Conflicts with superiors would then be erroneously connected to retirement intentions. Data from 1995 is not included in the analysis because of two drawbacks. First, between 1992 and 2007, several reforms in the German public pension system were introduced. These reforms – among other objectives – sought to prolong the working life of individuals through financial disincentives and age adjustments for the eligibility of old-age pensions. The reform in 2001 differed from previous reforms by abolishing the pay-as-you-go system and replacing it with a multi-pillar system. The reform in 2001 also cut future pension levels to enable the contribution rates to raise moderately (Wilke 2008). This may have had effects on retirement planning of individuals. Second, the coding schemes of the dependent variable in the SOEP differ in 1995 from those in 2001 and 2007. While in 1995 retirement intentions are captured on a rough four-point scale, in 2001 and 2007, they were measured in a more detailed 11-point scale. Thus, data from 2001 and 2006 are pooled to fit a two period random-effects ordered logistic model (Wagner et al. 2007). The analysis is restricted to employed persons aged 55 to 64, conforming an unbalanced panel of 1,701 observations.

The variables used in the analysis are defined in Table 1-1.

Table 1-1 Variable definitions and descriptive statistics

<i>Variable</i>	<i>Definition</i>	<i>Mean</i>	<i>Std. Dev.</i>
Retiring	Retirement intentions of individual ranging from 0 'definitely not' over 10, 20, 30, 40, 50, 60, 70, 80, 90 to 100 'definitely' on an 11-point scale	26.008	37.938
Conflict with superior	Dummy equal to 1 if individual experiences conflict with superiors at work	0.133	0.340
Health status	Subjective health status of individual ranging from 0 'very good' to 4 'bad' (= reference category)		
0 - very good	Dummy equal to 1 if individual's health status 'very good'	0.036	0.186
1 - good	Dummy equal to 1 if individual's health status 'good'	0.379	0.485
2 - satisfactory	Dummy equal to 1 if individual's health status 'satisfactory'	0.419	0.493

3 - poor	Dummy equal to 1 if individual's health status 'poor'	0.143	0.350
Age	Age of individual	58.264	2.478
Male	Dummy equal to 1 if individual is male	0.588	0.492
Married	Dummy equal to 1 if individual's family status is married	0.848	0.359
Household income	Household post-government income	39820.27	20732.13
Ratio wage/household income	Individuals net income last month in relation to the household post-government income	0.534	0.264
Long-term unemployment	Month of long-term unemployment	5.144	14.460
Parental leave	Month of parental leave	0.076	0.956
Education	Years of education	12.228	2.790
Autonomy	Occupational autonomy where 1 'apprentice/trainee', 2 'unskilled work', 3 'qualified work', 4 'high-qualified work/leadership role', 5 is 'managerial functions'	1.631	0.822
Civil service	Dummy equal to 1 if individual is employed in civil service sector	0.368	0.482
Firm size	Firm size that individual works in ranging from 1 'less than 5 employees' to 5 'more than 1999 employees' (= reference category)		
1 - Firm size <5	Dummy equal to 1 if individual works in firm with less than 5 employees	0.072	0.259
2 - Firm size 5-19	Dummy equal to 1 if individual works in firm with 5 to 19 employees	0.142	0.349
3 - Firm size 20-199	Dummy equal to 1 if individual works in firm with 20 to 199 employees	0.354	0.479
4 - Firm size 200-1999	Dummy equal to 1 if individual works in firm with 200 to 1999 employees	0.226	0.418
German	Dummy equal to 1 if individual has German nationality	0.928	0.259
Part-time	Dummy equal to 1 if individual is regularly part-time employed	0.220	0.415
Occupational status	Occupational status of individual where 1 'apprentice/trainee' (does not apply because of age restrictions), 2 'blue-collar', 3 'white-collar', 4 'civil servant' (= reference category)		
2 - Blue-collar	Dummy equal to 1 if individual is a blue-collar worker	0.323	0.468
3 - White-collar	Dummy equal to 1 if individual is a white-collar worker	0.557	0.497
Working sector	Sector that the individual is working in where 1 'agriculture', 2 'energy', 3 'mining' (= reference category), 4 'manufacturing', 5 'construction', 6 'trade', 7 'transport', 8 'bank, insurance', 9 'services'		

The dependent variable is a worker's retiring intention. This paper relies on the employee's rating of his or her probability to retire within the next two years. The SOEP covers retirement intentions as an ordinal variable measured via the question: "How likely is it that the following career changes - retire, either at the normal age or earlier - will take place in your life within the next two years" and employees rate the probability on a 11-point scale from 0 "definitely not" to 100 "definitely." The likelihood of retiring within the next two years is 26 percent.

The explanatory variable of interest is conflict with superiors and was scaled ordinal in 2001. Employees stated whether they often have conflicts and difficulties with their superior on a 3-point scale: 1 refers to "completely", 2 to "partly" and 3 to "not at all". In 2006, employees indicated whether they occasionally do have arguments or conflicts with superiors at work that weigh upon them. The distribution of both variables is presented in Table 1-2.

Table 1-2 Distribution of variable conflict with superior in 2001 and 2006

Year	Conflict with superior	Frequency	Percent
2001	does not apply	621	78.31
	applies partly	155	19.55
	applies fully	17	2.14
	Total	793	100
2006	no	853	93.94
	yes	55	6.06
	Total	908	100

The information of both variables is summarised into a dummy variable at the very meaning of its responses. The dummy variable used in the analysis is coded as 1 if the statement “having conflict with superior” applies partly or fully as well as if the employee indicates to “occasionally have conflicts with superior” and 0 otherwise. 13.3 percent of employees reported having some conflict with their superiors.

Health status constitutes an important variable for the analysis of retirement. While little doubt is cast on the fact that bad health is a predictor for early retirement, there is an ongoing discussion about whether empirical analysis should be based on objective or subjective health measures, or some combination of both (Bound 1990; Dwyer/Mitchell 1999; Kerkhofs et al. 1999; Crossley/Kennedy 2002). A more recent paper of Kalwij and Vermeulen (2008) investigates self-reported health and the value added of various objective health measures within the retirement decision across Europe. Results for Germany indicate that self-reported health does a good job in predicting retirement decisions. This paper uses the subjective health measure because it provides two decisive benefits. First, it is highly correlated with an individual’s objective health status. Second, subjective health status is a comprehensive measure for different diseases, some of which may influence labour force participation (e.g., cancer, stroke) in contrast to some others (e.g., high blood pressure, diabetes). The subjective health status of individuals is a self-rated ordinal variable taking on values from 0 ‘very good’ to 4 ‘bad’.

Other important determinants of retirement intentions are age (a ratio variable) and gender (with a dummy variable set to 1 for males). Additional covariates are the family status (being married), the amount of household income and the individuals’ wage in relation to the household income, times of unemployment and parental leave, the educational level, the employee’s job autonomy, whether the individual is being employed in civil service or other, the firm size he/she is employed in, the employee’s nationality, the incidence of part-time employment as well as the occupational status and the working sector of the employee.

1.4 Results

Table 1-3 presents a series of random-effects ordered logistic estimations.

Table 1-3 Random-effects estimations on retirement intentions

	<i>E1</i>	<i>E2</i>	<i>E3</i>	<i>E4</i>
Conflict with superior	0.389 (2.919)***	0.492 (2.766)***	0.533 (2.943)***	0.515 [0.093] (2.811)***
Very good health		-1.159 (-2.283)**	-1.097 (-2.141)**	-1.061 [-0.222] (-2.052)**
Good health		-1.482 (-3.656)***	-1.420 (-3.472)***	-1.455 [-0.278] (-3.515)***
Satisfactory health		-1.007 (-2.582)***	-0.949 (-2.412)**	-0.966 [-0.206] (-2.420)**
Poor health		-0.643 (-1.608)	-0.550 (-1.361)	-0.534 [-0.123] (-1.303)
Age		0.449 (8.918)***	0.465 (9.082)***	0.492 [0.080] (9.482)***
Male		-0.200 (-1.569)	-0.320 (-2.094)**	-0.383 [-0.062] (-2.227)**
Married			0.246 (1.292)	0.267 [0.043] (1.385)
Household income			0.000 (1.760)*	0.000 [0.000] (1.308)
Ratio wage/household income			0.366 (1.193)	0.344 [0.056] (0.996)
Long-term unemployment			0.005 (1.227)	0.008 [0.001] (1.856)*
Parental leave			-0.277 (-1.865)*	-0.324 [-0.052] (-2.110)**
Education			-0.080 (-2.723)***	-0.061 [-0.010] (-1.801)*
Autonomy			0.134 (1.562)	0.009 [0.001] (0.069)
Civil service			0.008 (0.054)	-0.001 [0.000] (-0.005)
Firm size <5				-1.150 [-0.186] (-3.575)***
Firm size 5-19				-0.708 [-0.114] (-2.904)***
Firm size 20-199				-0.557 [-0.090] (-2.951)***

Firm size 200-1999				-0.736 [-0.119] (-3.536)***
German				0.027 [0.004] (0.104)
Part-time				0.205 [0.033] (1.134)
Blue-collar				0.198 [0.032] (0.600)
White-collar				0.352 [0.057] (1.041)
Working Sector				included
Loglikelihood	-2,498.735	-2,326.032	-2,315.577	-2,291.441
N	1701	1701	1701	1701

Method: Random-effects ordered logistic model. The table shows the estimated coefficients. Z-statistics are in parentheses. Marginal effects are in square brackets and show the effect on the probability of retiring that is added from 50 to 100 percent ($P(Y \geq 50)$). Marginal effects of dummy variables are evaluated for a discrete change from 0 to 1. Dependent variable: Probability of retiring within the next two years (11-point scale). * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

The first estimation includes the key variable, conflict with superior. The coefficient is significant and shows a positive association, which suggests that having conflict with a superior significantly raises the probability of retirement within the next two years. The result supports the baseline hypothesis H1. Employees who experience conflicts with their superior have higher intentions to retire than their counterparts without conflicts at the workplace. The second estimation in Table 1-3 adds health status as the second key variable. The second estimation also includes age and gender. After controlling for these additional variables, the key variable conflict with superior remains significant. Health status also has a statistically significant negative association in the model. This indicates that employees in good health, compared to their counterparts in bad health (reference category), have fewer intentions to retire. The results from estimation 2 provide support for the baseline hypothesis H2. The other controls in estimation 2 of Table 1-3 show the expected signs, providing support for the notion that for older individuals the probability of retiring naturally rises whereas men retire later. Estimation 3 extends the model by variables that control for marital status, the financial situation of the household, interruptions of employment (times of unemployment and parental leave) as well as education, autonomy at workplace and being employed in civil service. Though financial determinants (household income, ratio of wage and household income) and budget constraints (month of long-term unemployment, month of parental leave) play a role, social factors place considerable weight on retirement plans. These results are in line with studies that emphasize the influence of social variables in the retirement process. Rather than ruling out financial vs. social factors, it may be a matter of the level that is focused. Schils (2008) and Blanchet and Debrand (2008)

provide interesting findings that can serve to put the pieces together. They argue that the generosity of retirement schemes is important in explaining retirement behavior across countries (i.e., at the macro-level). However, at the micro-level non-financial determinants have a higher impact.

Estimation 4 finally adds a wide set of controls exploiting the broad information given in SOEP. Estimations 3 and 4 underscore the existence of the main effect: Even after taking into account a wide set of other influencing factors, the fact that conflicts with superiors rise retirement intentions remains significant. Results persist with robust standard errors. In estimation 4, the marginal effects on the retirement intentions are calculated at the means of the independent variables. For ease of interpretation, the marginal effects are reported if the chance for retiring is at least 50 percent – that is, the probability to retire is very likely. Therefore, the marginal effects of responses “retiring is 50 percent likely” up to “retiring is 100 percent likely” are added ($P(Y \geq 50)$). Having conflicts with superior raises the probability to retire very likely by 9 percentage points. The second key variable, health status, has a negative impact on retirement intentions and is also statistically significant. For example, being in very good health decreases the probability of being very likely to retire by 22 percentage points, compared to being in poor health. Besides the key variables, conflict with superior and health status, all significant controls in estimation 4 show the expected signs.

To further analyse the moderating effect of health, an interaction effect between conflict with superiors and health status was introduced into the model. A significant interaction term would detect an intervening role of health status on the effect of having conflict with the superior. Estimation results are shown in Table 1-4.

Table 1-4 Random-effects estimations on retirement intentions: interaction between conflict and health status

	<i>E1</i>	<i>E2</i>	<i>E3</i>	<i>E4</i>
Conflict with superior	0.389 (2.919)***	0.660 (3.254)***	0.709 (3.447)***	0.673 [0.124] (3.216)***
Health status (0 = very good, 4 = bad)		0.408 (4.874)***	0.411 (4.836)***	0.423 [0.068] (4.885)***
Interaction Conflict superior x Health status		-0.269 (-1.846)*	-0.287 (-1.941)*	-0.259 [-0.042] (-1.717)*
Age		0.452 (8.992)***	0.467 (9.154)***	0.497 [0.080] (9.540)***
Male		-0.204 (-1.600)	-0.329 (-2.148)**	-0.399 [-0.064] (-2.309)**
Married			0.224 (1.180)	0.243 [0.039] (1.259)

Household income			0.000 (1.878)*	0.000 [0.000] (1.402)
Ratio wage/household income			0.397 (1.291)	0.363 [0.058] (1.043)
Long-term unemployment			0.006 (1.279)	0.009 [0.001] (1.899)*
Parental leave			-0.275 (-1.867)*	-0.322 [-0.052] (-2.101)**
Education			-0.083 (-2.834)***	-0.065 [-0.010] (-1.900)*
Autonomy			0.143 (1.673)*	0.033 [0.005] (0.248)
Civil service			0.034 (0.241)	0.020 [0.003] (0.106)
Firm size <5				-1.132 [-0.179] (-3.506)***
Firm size 5-19				-0.706 [-0.126] (-2.882)***
Firm size 20-199				-0.561 [-0.104] (-2.961)***
Firm size 200-1999				-0.698 [-0.125] (-3.361)***
German				0.037 [0.006] (0.143)
Part-time				0.196 [0.031] (1.075)
Blue-collar				0.190 [0.028] (0.573)
White-collar				0.314 [0.048] (0.926)
Working Sector				included
Loglikelihood	-2,498.735	-2,326.573	-2,315.78	-2,292.501
N	1701	1701	1701	1701

Method: Random-effects ordered logistic model. Dependent variable: Probability of retiring within the next two years (11-point scale). * p<0.1; ** p<0.05; *** p<0.01. The table shows the estimated coefficients. Z-statistics in parentheses. Marginal effects are in square brackets and show the effect on the probability of retiring that is added from 50 to 100 percent ($P(Y \geq 50)$). Marginal effects of dummy variables are evaluated for a discrete change from 0 to 1.

The first estimation, again, starts with the key variable conflict. The second estimation extends the model by the controls for health status, the interaction term conflict*health as well as the age and gender controls. In this estimation, both the key variable conflict and the moderator variable health status are significant: An employee is significantly more likely to intend to retire if he or she

reports having conflicts with superiors. Similarly, as the employee's health status becomes worse, the higher are the retiring intentions. The interaction term in the second estimation is found to be negatively associated and significant, supporting hypothesis H3. Health appears to moderate the effect of having conflicts with superiors. That is to say, the effect of having conflict with superiors changes, depending on the health status of the employee. Employees in poor health have the highest likelihood of intending to retire. Among employees in bad or poor health, additional conflicts with superiors only contribute marginally to increased retirement intentions. Having conflicts with superiors does not dramatically increase their retiring intentions. But for healthy employees, the effect of conflicts on retiring intentions seems to be more intense. Among healthy employees, the effect of conflicts is much more pronounced. Estimation 3 and 4 finally account for all other control variables. The pattern of the interaction term between conflict and health status remains. Results remain consistent with robust standard errors. Computations of the marginal effect estimate that the effect of conflicts on retiring intentions is intensified by 4.2 percentage points as the employee's health status worsens gradually. Stated a different way, all employees are more likely to retire when they are having conflicts with their superior. However, among healthy employees, the same conflict raises retirement intentions even more. Healthy people may be able to continue working, but they not necessarily do so because other factors – namely conflict with superiors – become more important. Estimations results and marginal effects suggest that being ill is a major obstacle to continued working. An unfavorable health status dominates the decision to retire, and so other factors like conflict with superiors only contribute marginally. Once that favorable health conditions are given, social factors like conflict with superiors become more important for retirement planning.

1.5 Discussion

These results must be considered with some study limitations in mind.

In order to account for modifications in the public pension regulations between 2001 and 2007, wave dummies were introduced. When introducing wave dummies into the model, the significance of key variable does not change, but reduces in magnitude. The wave dummies are significant and positive, indicating that employees in 2001 were more likely to report higher retiring intentions than in 2007 (results not shown). This is in line with development of a longer working life for older employees seen between 2000 and 2010.

Another study design concern derives from the appropriate use of health measures. In order to verify the use of self-reported health, the estimations were re-run by including objective, rather than subjective health measures. The objective health measure was the number of annual doctoral visits.

Table 1-5 Random-effects estimations on retirement intentions: subjective vs. objective health measures

	<i>Subjective health</i>	<i>Objective health</i>
Conflict with superior	0.515 (2.811)***	0.514 (2.820)***
Very good health	-1.061 (2.052)**	
Good health	-1.455 (3.515)***	
Satisfactory health	-0.966 (2.420)**	
Poor health	-0.534 (1.303)	
Number of doctoral visits		0.020 (4.510)***
Controls	x	x
sigma2_u		
N	1701	1700
Loglikelihood	-2,291.44	-2,295.82

Method: Random-effects ordered logistic model. The table shows the estimated coefficients. Z-statistics are in parentheses. Dependent variable: Probability of retiring within the next two years (11-point scale). * p<0.1; ** p<0.05; *** p<0.01.

The findings in Table 1-5 indicate that the estimation results are robust enough to use either the subjective or objective health measures. The direction of association, significance, and magnitude of the key variable (conflict with superiors) did not change.

The evidence of the estimation results of this paper is correlational, and endogeneity cannot be ruled out. This concern persists as no instrumental variable could be found that would capture the information of having conflicts with superiors. However, as the link between conflict with superiors and retiring intentions became stronger as additional controls were accounted for, endogeneity does not seem to be a severe problem.

The link between conflict with superiors and retirement intentions also becomes stronger if the age restriction (employees aged 55 to 64 years) is relaxed. Age restriction reduces sample size, challenging model fit and coefficient estimation. For the purpose of generalising the results, estimations were re-run with alternative age restrictions. Three comparison samples included employees aged 55 to 70 years, 18 to 70 years and 18 to 80 years, in consideration of the fact that younger employees are eligible for a pension due to reduced working capacity (Erwerbsminderungsrente) as well as older employees who continue working beyond the retiring

age. Then, the sample size is largely increased and the coefficient of the conflict variable becomes more significant. However, the comparison samples also reveal that conflicts with superiors matter more for older than for younger employees, supporting the core hypothesis of this paper.

Finally, existing conflict between employees and their superiors is represented by a dummy variable in the analysis. This was done because of a lack of detailed information across the years 2001 and 2006. Because the information on conflicts with superiors was provided in binary form in 2006, the three-scaled variable from 2001 was also coded as a dummy variable. On the one hand, summarising is equivalent to a reduction of information. On the other hand, even with regard to this limitation, the correlation between conflicts and retirement intentions was found to be significant. Due to this limitation, the present paper is rather an impulse for more profound research on social factors predicting retirement. The development towards an ageing working population may suggest that this field is worth pursuing in future research.

1.6 Conclusion

The huge share of older employees in Germany's workforce and the consequences that may arise when they retire provides justification for the study of older employees and the factors that determine their intentions to retire. Good relations at work seem able to influence an employee's retirement intentions as older employees give more importance to social factors in their private lives as well as within the work domain.

Former research that investigated retirement intentions focused broad concepts, such as work quality, rather than specific factors, such as conflicts with superiors. Other previous investigations did focus on interpersonal conflicts and their influences on health, work disability or occupational mobility, omitting possible influences on retirement intentions. The present paper analyses the effect that conflicts with superiors can have on retirement intentions. It extends previous research by connecting the analysis of conflict with superiors to the analysis of retirement intentions.

Data from SOEP in 2001 and 2006 were used to run a two-period, random-effects ordered logistic model with retirement intentions as the dependent variable. Estimation results show that conflicts and individuals' health status matter when considering the probability of retirement. Having conflict with superiors significantly raises the probability of retirement intentions, even after taking a wide set of controls into account. Employees with good health have fewer intentions to retire. Introducing an interaction term between conflict and health reveals a slight but notable moderating effect of

health status: Among healthy employees the occurrence of conflict with superiors raises retirement intentions even more than among unhealthy employees.

This paper points to the role of social factors within the retirement process. Though financial determinants and budget constraints clearly affect retirement intentions, conflicts with superiors reveal considerable weight within the evolution of retirement plans. But rather than ruling out financial vs. social factors, it may be a matter of level (macro vs. micro) that is focused.

The results of the present paper have implications for the management of a firm, particularly when facing skill shortage. This may hold true for small firms that cannot compete with wages of medium-sized or large firms. Good relations at work and a good working environment may delay retirement among older employees. In recognizing the importance of these social factors, a small firm may make more focused attempts to keep experienced older employees. Moreover, good relations at work usually come along with positive side-effects such as increased job satisfaction, higher motivation to work and higher productivity. This research contributes to a body of work that suggests that there are several valuable effects for firms when investing in a low-conflict working atmosphere.

2 Religion Predicting Fertility Behaviour of Young Women in Contemporary Germany

Abstract: Religion in contemporary Germany is marked by institutionalized outreach as well as increased pluralisation. Religion can thus play a decisive role in fertility behaviour, despite of secularizing tendencies. Religion may influence the debut and frequency of sexual activity, contraceptive behaviour, cohabitation and marriage. Religious rules on alcohol consumption relate to the likelihood of miscarriages; religious values transmit into abortion laws. This fertility behaviour determines the time when young women have their first live birth. Using data from the German Panel Analysis of Intimate Relationships and Family Dynamics, the paper explores whether being Catholic, Protestant, Muslim or non-religious shapes fertility patterns of young women in contemporary Germany. The paper extends earlier analyses by integrating miscarriages and abortions, rather than limiting the analysis to births. Results show that Muslims are the youngest when becoming pregnant for the first time. Protestants delay first pregnancy, but once being pregnant, Protestants are more likely to carry their first pregnancy to term rather than having an abortion. With respect to first pregnancy and its outcome, Catholics surprisingly compare to non-religious women. Against the background of increasing immigration from religiously vivid countries to Germany, the relation between religion and fertility behaviour is likely to remain significant.

Keywords Religion, pregnancy, miscarriage, abortion, live birth, young women

JEL Z12, J13

2.1 Introduction

In Germany, there is an institutionalized outreach of Christian religion on individuals – irrespectively of the continued secularization of the last decades. The subsidiarity principle, for example, claims that church and state cooperate in domains like social service provision, family services and childcare. Also, religious parties, schools or informal education appear powerful mechanisms to ensure religious values transmission. At the same time, an increasing immigration of people from Muslim majority countries can be observed throughout the second half of the twentieth century up to the present (Norris/Inglehart 2004, Voas/Fleischmann 2012). The share of Muslims in Germany is estimated between 4.3 and 5 percent of the population (Deutsches Institut für Wirtschaftsforschung 2018, Evangelische Kirche in Deutschland 2013). The Muslim influence on youth works to a greater extent through the religious vitality among immigrants. Within Turkish immigrant families, cultural values such as conservative gender roles and filial obligations remain important (De Valk/Liefbroer 2007). Both religions, Christianity and Islam, found on procreative principles (Bible, Gen 1:28; al-Kahf (Sura 18:46)). But Catholicism, Protestantism and Islam differ in certain norms and rules towards sexual activity, contraception, abortion as well as marriage and divorce. The extensive role that religion can play in fertility only becomes visible when the different pregnancy determinants – sexual activity, contraceptive behaviour, cohabitation, marriage – as well as fertility events – miscarriage, abortion, live birth – are considered. Religion can exert different influence on any of these fertility channels. On the one hand, religion may delay sexual debut and thus delay childbearing. On the other hand, religious norms may restrict contraceptive usage and thus foster childbearing. Moreover, religion may influence the fundamental decision whether to have or not to have a child at all, particularly in the first stage of pregnancy when abortion is an option. Thus, the net effect of religion on fertility can only be assessed if all pregnancy determinants and fertility events are considered simultaneously.

In fact, few empirical studies have taken into account all fertility channels. Some exceptions include e.g. Miller/Valente (2016), Freedman et al. (1961), Teachman/Schollaert (1991), Mosher et al. (1992), Brewster et al. (1998), Pearce (2010) and Levine (2001), where different channels are considered simultaneously. However, a large part of research on religion and fertility is originated in US-evidence. This paper contrasts evidence from Germany. At first, the present paper differentiates between the denominations Catholic, Protestant and Islam. Second, it not only looks at birth events but incorporates also the other two competing fertility events miscarriage and abortion. Third, the paper considers important pregnancy determinants like sexual activity, contraceptive usage, cohabitation and family formation behaviour. Fourth, most research, e.g. Kreyenfeld et al. (2011),

relies on retrospective fertility data. In contrast, this paper gains from rich prospective information on fertility behaviour of women born between 1991 and 1993.

Estimation results reveal that Protestant faith still influences fertility behaviour, that Muslims are youngest when becoming pregnant for the first time and that Catholic fertility behaviour compares to that of non-religious women despite relatively strict norms regarding contraception and abortion. Results further suggest that young women living in East Germany have a lower chance to abort first pregnancy. Cohabitation has become a more important prerequisite for a baby than marriage.

2.2 Theory and empirical evidence

2.2.1 Sexual activity

According to Catholic doctrine, the very aim of sexual intercourse is procreation. For Protestants and Muslims, procreation is one important function of sexual intercourse. Catholic doctrine orders procreation to occur within marriage. In Islam, premarital sex is considered a moral issue which is taboo. However, for Protestants, procreation can also occur out-of-wedlock. All three religious teachings should imply the postponement of sexual debut as well as less sexual activity among adolescents. Largely concurrent across different research studies, there are found negative associations for adolescents between religion and sexual activity: religious people have their sexual debut later or are sexually less active during their pre-marital period (Studer/Thornton 1987, Goldscheider/Mosher 1991, Brewster et al. 1998, Levine 2001, Meier 2003, Jones et al. 2005, Uecker 2008, Burdette/Hill 2009, BgZA 2010, Smith 2014, Hull et al. 2015).

2.2.2 Contraceptive usage

Religion has different guidelines for contraceptive usage. Whereas Catholicism puts a ban on artificial contraception (Noonan 1986), Islamic teaching has a long tradition in promoting contraception, which, however, is only valid within marriage – outside marriage, it is considered taboo (Omran 1992). Protestant denomination adjusts guidelines to the circumstances of the woman. Women should be prevented from giving birth too young, too old or in too rapid spacing. Therefore, the usage of contraceptive methods is basically approved, though contraceptives have to be applied with responsibility and in consent with the partner (Evangelische Kirche in Deutschland 2004). Empirical evidence shows ambivalent results for Catholic denomination. Throughout the 1960s and 1980s, religious denomination and religiosity continued to be important factors for contraceptive usage (Goldscheider/Mosher 1991). Further, bivariate results indicate that Catholic

adolescents agree more often than non-religious adolescents that using contraceptives is morally wrong. On the other hand, there are more Catholic adolescents than non-religious adolescents who report having used contraceptives at first sex and most recent sex (Regnerus 2007, Bundeszentrale für gesundheitliche Aufklärung 2004). In Germany, young Muslim women feel less informed about contraception than women of other denominations. Immigrant women show lower contracepting incidence at first intercourse – and if they contracept, they tend to apply less efficient methods (Bundeszentrale für gesundheitliche Aufklärung 2010). Analysis focusing on Protestants mainly found few or no differences in contraceptive behaviour compared to other religions (Brewster et al. 1998, Goldscheider/Mosher 1991). Substantially distinctive contraceptive behaviour is rather found among fundamentalist Protestants in the United States who are less likely to use contraceptives (Kahn et al. 1990, Mosher/McNally 1991, Studer/Thornton 1987) or among Protestants in non-western societies who are more likely to use contraceptives (Agadjanian 2001).

2.2.3 Cohabitation and marriage

Religions widely mark family-oriented norms. Most religions promote the creation and raising of children within the institution of marriage. At the same time, many religions discourage divorce. The main Eurasian religions, including Islam and Christianity, comprehend family relationships as sacred (Zimmerman 1974). On cohabitation behaviour, religion usually is silent. However, cohabitation is usually a pre-step to marriage. A great part of couples only transforms into spouses after having passed a period of cohabitation. Regarding fertility timing, the net effect of religion on marriage is not clear. On the one hand, the time of marriage may be preponed – in order to set the prerequisites for childbearing. On the other hand, time of marriage may be delayed because the search for the right spouse is longer - as a consequence of condemned divorce. Empirical evidence seems to uniformly outweigh early marriage and rather supports the delaying effect of religion for Catholics and Protestants (Hammond et al. 1993, Thornton et al. 1992, Sander 1995, Lehrer 2004, Eggebeen/Dew 2009, Hiekel et al. 2015). To the contrary, Muslim women in Europe marry earlier than average and among German Muslims, divorce is less accepted. There are hints that differences in marital behaviour are important in understanding Muslim fertility (Westoff/Frejka 2007, De Valk/Liefbroer 2007, Inglehart et al. 2014).

2.2.4 Miscarriage

Beside well recognized causes of miscarriage like uterine malformations and balanced chromosomal rearrangements in parents (García-Enguádanos et al. 2002), there are causes of

miscarriages that are due to the lifestyle of the mother. Well documented is the consumption of alcohol during pregnancy: the risk of miscarriage is significantly increased if the mother consumed alcohol (e.g. Avolos et al. 2014, Feodor Nilsson et al. 2014). The consumption of alcohol may be a cause of miscarriage that is related to religion. Islam restrains alcohol consumption (Elger 2006). This may lead to lower incidence of miscarriages among Muslim women compared to non-Muslim women. Religious norms then save the unborn foetus from risk.

2.2.5 Abortion

The influence of religion on abortion in Germany is particularly apparent. The two Christian parties CDU and CSU contribute to the definition of abortion laws. In addition, women have to receive consultation prior to non-medical or non-criminal abortions (StGB 2017). The consultation offices in Germany are either run by religiously independent organisations such as ProFamilia or by the Catholic and Protestant church (e.g. Caritas, Social Service of Catholic Women). By obligatory consultation prior to abortion, the Church doctrine has influence on the women's decision-making at a quite sensible moment. The Christian church's disapproval of abortion is well documented in several studies (Legge 1983, Rattinger 1993, Scott 1998, Banaszak 1998, Franz/Busch 2004, Jelen et al. 1993). Protestants seem more relaxed with these issues than Catholics, non-denominated persons are most relaxed (Pollack/Müller 2013). The disapproval on abortion is found also in Islamic teaching. However, abortion is allowed depending on the circumstances of pregnancy and stage of gestational development. Yet, higher abortion prevalence is common. For example, the preference for boys in many Muslim countries leads to a higher prevalence of female fetuses abortion (Rispler-Chaim 2008, Unnithan-Kumar 2010). Moreover, Islam allows abortion within marriage, but pregnancy out of marriage is not accepted under sharia law or in Muslim society. Then, abortions can help to maintain the social status of unmarried women. Many abortions have been the result of unplanned or unwanted pregnancies of unmarried women (Bowen 1997).

2.2.6 Timing of first birth

The preceding pregnancy determinants and fertility events shape the timing of a women's first birth. In the US, the probability of having first birth up to age 23 is significantly lower for Catholics (Rindfuss et al. 1988). Similarly, the probability of live birth for teenagers is significantly lower when they score high on a religious scale (Smith 2014). Miranda (2006) provides evidence from Mexico where young Catholic women have delayed entry into motherhood. For Catholics in Austria, Heineck (2006) finds a rather delaying, though not significant, effect on transitions to first birth. Turkish and

Moroccan immigrant women prefer younger ages for entry into motherhood than native women (De Valk/Liefbroer 2007). As the dissolution of marriage is condemned for Catholics, marriage usually occurs later for them. This in turn postpones first childbearing. Teachman and Schollaert (1991) show that Catholics are older when first having kids, but Catholics are faster when measured as duration from marriage. They find out that Catholics delay marriage compared to non-Catholics but once being married, Catholicism speeds birth timing. Pearce (2010) applies event-history analysis. Her results show that those raised Catholic are more likely to have a premaritally conceived birth than those raised mainline Protestant. In her sample, Catholics and non-religious people have an equal chance of non-marital first birth. However, her models do not account for sexual activity, contraceptive behaviour and possible abortions.

2.3 Methodology

The net effect of religion on young women's fertility timing in contemporary Germany will be estimated by using the German Panel Analysis of Intimate Relationships and Family Dynamics (pairfam). Pairfam is a representative, annual panel survey of currently nine waves with a rich set of information on demography, partnership, fertility, parenting and intergenerational relationships (Huinink et al. 2011, Brüderl et al 2018). The first wave started in 2008/2009 reaching 12,402 persons. The dataset provides detailed information on religion and on fertility determinants like sexual activity and contraceptive usage. Prospective information in the dataset allows for the right temporal ordering of religious influence on fertility (Marcum 1988). The estimations are restricted to the youngest cohort 1991-1993 where information on fertility determinants during adolescence (e.g. frequency of intercourse, contraceptive usage) are available. The youngest cohort consists of 4,337 respondents in the first wave, where 1,816 females aged 14 to 18 participated at least twice in the survey. The sample is restricted to women who did not have had a live birth before the first interview. Jewish women and women of other religions than Christ or Muslim are excluded because they have no birth events in this sample.

The dependent variable of primary interest is the event of first live birth in a subsequent wave. A discrete-time hazard model is applied. Live birth is an event that is determined by a causal process. After sexual intercourse, pregnancy is the first event that may follow. After becoming pregnant, the woman decides whether to have a live birth or to abort the foetus, where the latter alternative is a quite frequent option among young women (Statistisches Bundesamt 2014, Cygan-Rehm/Riphan 2014). Miscarriage constitutes a similar event to abortion as it terminates pregnancy via non-live

embryo or foetus. These multiple kinds of events require an estimation strategy that accounts for conditional processes (Allison 2014). Several fertility analyses assess the birth event without further distinctions between abortion, miscarriage and live birth. In order to illustrate possible misspecifications, this paper will start with an estimation of birth events too, ignoring the causal processes of fertility decisions. Subsequently, this paper proceeds by taking into account these causal processes (Allison 2014) and running estimations on the event of pregnancy, followed by fitting a multinomial logit model on the different type of events abortion, miscarriage and live birth.

The key independent variable is the religion of the young women, measured as her denomination. Religious denomination captures the belonging to a religious group (e.g. Catholic, Protestant, Muslim) that is usually handed from parents to children and is acquired via baptism.

The estimations account for the controls age, age squared, enrolment in school or vocational qualification, the mother's and father's highest school degree as proxy for socioeconomic background, East German residence, years of sexual activity, contraceptive usage, as well as relationship status (having partner, cohabitating, being married). The likelihood of first birth has a gentle u-shaped relation: the likelihood decreases at very young ages, reaches a minimum and then increases with age. Therefore, estimations will include the variables age as well as age squared. Abundant research points to relevant fertility differentials between East and West Germany (e.g. Peter et al. 2015, Cygan-Rehm/Riphan 2014, Arránz Becker et al. 2010), consequently a dummy will be integrated indicating whether the woman lives in East Germany. Due to compulsory school attendance, adolescents aged until 18 years are to a very high share enrolled in general or vocational education (Niehues/Rux 2006). Enrolment in education and educational attainment exert clear negative effects on underage conception (Paton 2002), on teenage fertility (Alzúa/Velázquez 2017), on entry into motherhood (Blossfeld/Huinink 1991) and on total fertility rate (McClamroch 1996, Castro Martin 1995). Many of the young women of the present analysis are still enrolled in education, are not yet independent from their parental home and do not earn their own stable income. The young women's income or prestige of their employment does not work sufficiently to resemble socioeconomic background. Therefore, parental educational attainment is used as a proxy for socioeconomic background. Wolfe et al. (2001) suggest that parental schooling has an effect on the probability of teen non-marital birth because parents serve as a role model, a provider of information and a monitor of the adolescent's behaviour. In order to prevent sample size reduction due to missing information, the missing values of the control parental highest school degree are encoded to the reference category throughout the estimations. In essence, they become the meaning of the least socioeconomic background where young women cannot even tell what their parent's education is. Further on, the years in which a woman is sexually active increase the

likelihood of pregnancy. It has been shown that early pregnancies are related to early first intercourse (e.g. Jones et al. 2005, BgZA 2010). The use of modern contraceptives, on the other hand, reduces the likelihood of pregnancy. Having a partner as well as cohabitating with him increases the occasions for sexual activities, which in turn increases the likelihood of pregnancy. Marriage is also of crucial relevance for subsequent childbearing (e.g. Arránz Becker et al. 2010).

In order to account for the possibility that religion effects resemble a woman's higher or lower intention to become mother, all models additionally controlled for fertility intentions. Fertility intentions summarize information on whether the woman tried to conceive a child or to get pregnant during the past twelve months as well as her future plans to become mother within the next two years. Further, a considerable number of women get married between the time of conception and delivery. Estimations in this paper control for those shotgun-marriages.

2.4 Results

The sample consists of 1,312 young women with 5,718 person-year observations throughout nine waves. Descriptive statistics are reported in Table 2-1. Roughly 34.2 percent of the young women are denominated to Catholic, 39.3 percent to Protestant Church and 0.9 percent to Islam, the remaining 25.6 percent have no denomination. The women in the sample are aged 14 to 25. About 21.4 percent of the women live in East Germany. The majority of women are still enrolled in education and most of their parents have an intermediate level of education. On average, the women have been sexually active for 3 years and about 13.2 percent do not use modern contraceptives. About 36.4 percent of the women indicate to be single, half of the women have a partner, another 13.1 percent is already cohabitating and a minority of 6.5 percent is already married. If only birth events are taken into account, there are in total 49 women who have their first live births in the sample. At an age between 15 and 26 years, in Germany, a considerable part of women did not have experienced first birth yet. But if all first pregnancies are taken into account – also pregnancies that lead to abortions or miscarriages, then the number of pregnancy events sums up to 108. These first pregnancies in the sample result in 36 births, 43 abortions, and 24 miscarriages. For another 5 pregnancies, it is not clear what type of event followed first because women indicated to have an abortion as well as a miscarriage and the date of the events within each wave is not reported. The number of abortions in the sample compares to official statistics in Germany that report relatively high abortion events at the beginning of a woman's fertility biography (Statistisches Bundesamt 2014).

Table 2-1 Descriptive statistics of the sample

<i>Variable</i>	<i>Definition</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>	
First birth in subsequent wave	Event of first birth in subsequent wave	5718	0.009	0.092	0	1	
Catholic	Dummy equal to 1 if denomination is Catholic	5718	0.342	0.475	0	1	
Protestant	Dummy equal to 1 if denomination is Protestant	5718	0.393	0.488	0	1	
Islam	Dummy equal to 1 if denomination is Islam	5718	0.009	0.092	0	1	
No denomination	Dummy equal to 1 if there is no denomination	5718	0.256	0.436	0	1	
Age anchor	Age of the young woman	5718	19.487	2.268	14	25	
Age anchor squared	Squared age of the young woman	5718	384.866	89.260	196	625	
Enrolment in education	Enrolment in school or vocational education	5718	7.221	4.734	0	13	
maternal educational attainment	no upper education	Dummy equal to 1 if mother of the young woman has low education	5718	0.616	0.486	0	1
	upper education	Dummy equal to 1 if mother of the young woman has upper education	5718	0.343	0.475	0	1
paternal educational attainment	no upper education	Dummy equal to 1 if father of the young woman has low education	5718	0.560	0.496	0	1
	upper education	Dummy equal to 1 if father of the young woman has upper education	5718	0.325	0.469	0	1
Residence in East Germany	Dummy equal to 1 if living in East Germany	5718	0.214	0.410	0	1	
Years of sexual activity	Number of years of sexual experience	5718	3.065	2.408	0	16	
No modern contraception	Dummy equal to 1 if not using modern contraception	5718	0.132	0.339	0	1	
Single	Dummy equal to 1 if being single	5718	0.364	0.481	0	1	
Having partner	Dummy equal to 1 if having a partner	5718	0.499	0.500	0	1	
Cohabiting	Dummy equal to 1 if cohabiting	5718	0.131	0.337	0	1	
Married	Dummy equal to 1 if being married	5718	0.006	0.080	0	1	

Table 2-2 presents the results of discrete-time hazard estimations on the transition to first live birth. Estimation 1 includes the denomination variables, showing that for Catholic and Protestant women, the likelihood of having a live birth in the next year is significantly reduced whereas Muslim women are more likely to have a live birth, though not significantly. The sign of the denomination coefficients does not change when more controls are included. Estimation 2 accounts for women's age, their educational enrolment and the parent's highest school degree as a proxy for socioeconomic background. Estimation 3 introduces a dummy for living in East Germany which is positive and significant, indicating that women in East Germany have their first live birth significantly earlier than women in West Germany. The East dummy seems to explain a great fraction of the variance because the z-value of the denomination coefficients decreases largely between estimation 2 and 3. It hints to the fact that the Catholic-dummy is a proxy for living in Western Germany.

Estimations 4 and 5 finally introduce years of sexual activity, contraceptive usage and relationship status. All controls show the expected signs, though none of these controls is significant. Also, the denomination coefficients are far from being significant in estimation 4 and 5. Note that the reference category throughout the birth-equations is not having a live birth but also having an abortion or miscarriage. The results of the birth estimations in table 2-2 may be misleading because important fertility determinants – abortion and miscarriage – are blended with not being pregnant within the same reference category. Many analyses on fertility show this haziness. Fortunately, pairfam data records abortion and miscarriage events.

Table 2-2 Adolescent's religion predicting transition to first birth – Random effects logit estimations

<i>First birth in subsequent wave</i>		1	2	3	4	5
		<i>Birth</i>	<i>Birth</i>	<i>Birth</i>	<i>Birth</i>	<i>Birth</i>
Catholic ⁽¹⁾		-1.092* (-2.49)	-1.362 (-1.52)	-0.689 (-1.00)	-0.975 (-0.56)	-0.889 (-0.39)
Protestant ⁽¹⁾		-1.280* (-2.52)	-1.741 (-1.52)	-1.113 (-1.30)	-1.957 (-0.35)	-1.994 (-0.38)
Islam ⁽¹⁾		1.213 (1.13)	1.196 (0.76)	1.617 (1.07)	4.444 (0.57)	4.221 (0.75)
Age anchor			2.183+ (1.68)	2.060+ (1.72)	3.092 (0.55)	3.093 (0.68)
Age anchor squared			-0.050 (-1.60)	-0.048 (-1.62)	-0.082 (-0.58)	-0.085 (-0.73)
Enrolment in education			-0.086* (-2.28)	-0.086* (-2.47)	-0.093 (-1.38)	-0.082 (-1.23)
maternal educational attainment ⁽²⁾	no upper education		-0.358 (-0.38)	-0.396 (-0.48)	-1.100 (-0.63)	-0.978 (-0.51)
	upper education		-0.848 (-0.73)	-0.730 (-0.73)	-1.691 (-0.50)	-1.540 (-0.48)
paternal educational attainment ⁽²⁾	no upper education		-0.341 (-0.45)	-0.306 (-0.48)	-0.138 (-0.09)	-0.199 (-0.14)
	upper education		-2.574+ (-1.66)	-2.339+ (-1.83)	-3.549 (-0.34)	-3.569 (-0.45)
Residence in East Germany				0.828+ (1.76)	1.224 (0.71)	1.187 (0.88)
Years of sexual activity					0.717 (0.42)	0.668 (0.49)
No modern contraception					1.515 (0.66)	1.560 (0.82)
Having partner ⁽³⁾						0.132 (0.21)
Cohabiting ⁽³⁾						1.951 (1.36)
Married ⁽³⁾						3.914

					(1.08)
Constant	-4.979*** (-7.12)	-28.34* (-1.98)	-26.90* (-2.08)	-39.89 (-0.53)	-39.31 (-0.67)
Insig2u	0.779 (0.84)	2.069+ (1.93)	1.759 (1.63)	3.211 (0.69)	3.225 (0.87)
Observations	5718	5718	5718	5718	5718
ll	-274.2	-259.8	-258.8	-249.2	-243.2

(1) Religion Reference = no denomination (2) Parental education Reference = missing information (3) Relationship Reference = single. Z-statistics in parenthesis. Z-values clustered at individual level. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

Table 2-3 presents results of discrete-time hazard estimations on the transition to first pregnancy. The analysis follows the approach for causal processes by Allison (2014) that lead to different kind of events (birth, abortion, miscarriage). The estimations in table 2-3 assess the influence of denomination on the fact to become pregnant (irrespectively of the outcome of pregnancy), compared to not becoming pregnant. These estimations assess the net effect of denomination on the incidence of pregnancy. Estimation 1 shows a strong influence of denomination on the likelihood of pregnancy. Similarly to the live birth equations in table 2-2, Catholic or Protestant women are significantly less likely to become pregnant in the subsequent wave. Catholic and Protestant faith indeed seems to delay pregnancies. Islam, on the contrary, seems to enhance pregnancy. Controls in estimation 2 show significant negative influence of being enrolled in education and of paternal educational attainment. Estimation 3 adds an East dummy which turns out to be positive but insignificant. This would imply that East German women do not become pregnant significantly earlier than their Western German counterparts. Similarly to the birth equations, the z-values of the Protestant and Catholic coefficient are diminishing, meaning that the East dummy explains substantial variation. In addition, the significance of the Catholic coefficient vanishes, indicating that the Catholic dummy is merely a proxy for living in West Germany rather than resembling religious influence on becoming pregnant. After accounting for the controls in estimation 3, one can see that Protestant women have a significantly reduced – and Muslim women significantly increased – likelihood to become pregnant than non-religious women. Estimation 4 introduces determinants that directly influence fertility outcomes. Every year that women are sexually active, their probability of becoming pregnant increases significantly. Pregnancy is also highly enhanced if women do not use modern contraceptives. Estimation 5 includes relationship controls that show that cohabitating plays a key role in predicting pregnancy in the subsequent wave. Within the full model and after accounting for pregnancy determinants, the significant negative influence of being denominated to Protestant church on becoming pregnant persists. Also does the significant positive influence on becoming pregnant for Muslim women. Catholic women are not more or less likely to become

pregnant than non-religious women. Their initially reduced likelihood to become pregnant was an artefact of other controls, mainly the West German residence, but also due to different contraceptive and family formation behaviour. Protestant women have on average a 0.3 percentage point decreased probability of becoming pregnant compared to non-religious women. The likelihood of Muslim women to become pregnant is increased by 6 percentage points compared to non-religious women. However, not every pregnancy ends in a live birth. Possible outcomes of pregnancy are a miscarriage or abortion. The outcome of pregnancy differs according to health status (miscarriage) as well as social norms, values and individual preferences (live birth, abortion). In order to estimate the likelihood of the different types of events (live birth, abortion, miscarriage), the following analysis continues with multinomial logit estimations that include only women who became pregnant.

Table 2-3 Adolescent's religion predicting transition to first pregnancy – Random effects logit estimations

<i>Pregnancy (of first fertility event)</i>		1	2	3	4	5
		<i>Pregnancy</i>	<i>Pregnancy</i>	<i>Pregnancy</i>	<i>Pregnancy</i>	<i>Pregnancy</i>
Catholic ⁽¹⁾		-0.798** (-3.14)	-0.770* (-2.29)	-0.490 (-1.40)	-0.521 (-1.21)	-0.478 [-0.002] (-1.16)
Protestant ⁽¹⁾		-1.338*** (-4.50)	-1.360** (-3.04)	-1.111* (-2.53)	-1.400* (-2.21)	-1.314* [-0.004] (-2.03)
Islam ⁽¹⁾		1.422* (2.00)	1.378 (1.57)	1.575+ (1.75)	2.896+ (1.90)	2.688+ [0.068] (1.77)
Age anchor			1.088 (1.48)	1.080 (1.47)	1.448+ (1.70)	1.400 [0.004] (1.64)
Age anchor squared			-0.026 (-1.37)	-0.026 (-1.36)	-0.039+ (-1.79)	-0.039+ [-0.0001] (-1.74)
Enrolment in education			-0.061** (-2.58)	-0.062** (-2.66)	-0.059* (-2.19)	-0.054* [-0.0001] (-2.00)
maternal educational attainment ⁽²⁾	no upper education		0.061 (0.11)	0.041 (0.08)	-0.0683 (-0.09)	-0.0667 [-0.0002] (-0.10)
	upper education		-0.301 (-0.47)	-0.276 (-0.44)	-0.484 (-0.58)	-0.434 [-0.001] (-0.55)
paternal educational attainment ⁽²⁾	no upper education		-0.782+ (-1.89)	-0.775+ (-1.94)	-0.923 (-1.62)	-0.874 [-0.004] (-1.56)
	upper education		-1.445* (-2.04)	-1.408* (-2.05)	-1.754+ (-1.94)	-1.613+ [-0.006] (-1.83)
Residence in East Germany				0.410 (1.43)	0.520 (1.32)	0.470 [0.001] (1.24)
Years of sexual activity					0.346* (2.07)	0.297+ [0.001] (1.73)
No modern contraception					1.210*** (3.85)	1.224*** [0.003] (3.52)
Having partner ⁽³⁾						0.199 [0.0004] (0.65)

Cohabiting ⁽³⁾					0.779* [0.003] (2.11)
Married ⁽³⁾					0.584 [0.002] (0.35)
Constant	-3.487*** (-8.32)	-13.82+ (-1.91)	-13.89+ (-1.95)	-18.33* (-2.12)	-17.49* (-1.97)
Insig2u	-0.735 (-0.32)	0.313 (0.16)	0.102 (0.04)	1.652+ (1.66)	1.406 (1.04)
Observations	5561	5561	5561	5561	5561
ll	-513.4	-496.5	-495.6	-480.7	-478.4

(1) Religion Reference = no denomination (2) Parental education Reference = missing information (3) Relationship Reference = single. Z-statistics in parenthesis. Z-values clustered at individual level. Average marginal effects in square brackets. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

The results of the multinomial logit model on the fertility events are presented in table 2-4. Once having become pregnant, the model estimates the influence of religion on the likelihood to have a live birth, an abortion or a miscarriage where abortion is the base outcome. The estimated marginal effect of each covariate on the probability of observing a live birth is displayed in parenthesis in the first column of table 2-4. Though the probability of pregnancy was shown lower for Protestants (table 2-3), the estimates of table 2-4 show that once being pregnant, for Protestant women it is significantly more likely than for non-religious women that their pregnancy ends in a live birth. Under the condition that the woman is not having an abortion or miscarriage, being Protestant (compared to being non-religious) increases the average probability of having a live birth in subsequent wave by 0.370. This seems not to be true for Catholic and Muslim women where the corresponding coefficients are insignificant. Recalling results from table 2-3, Catholics were not significantly more or less likely to become pregnant than non-religious women. In addition, results in table 2-4 show that there seems to be no distinctive fertility behaviour between Catholic and non-religious women, once they have become pregnant. For Muslim women, the results from table 2-3 indicated an increased likelihood of pregnancy. Table 2-4 now points to the fact that the outcome of Muslim pregnancies seems to be largely determined by the absence of miscarriages. Being Muslim, compared to being non-religious, significantly decreases the average probability of having a miscarriage by 0.284. As Islam restrains alcohol consume (Elger 2006), the lower incidence of miscarriages may be plausible. However, due to few fertility events within the small Muslim subpopulation, results have to be interpreted carefully. Women in East Germany are significantly more likely than women in West Germany to have a live birth compared to have an abortion. Pregnant women in East Germany have on average a 0.413 higher probability of giving birth than women in West Germany. Interestingly, women who do not use modern contraceptives are significantly less likely to have a live birth compared to having an abortion. Their average probability of giving birth is decreased by 0.428. At

first glance, unsafe contraception leading to fewer live births is counterintuitive. However, within the multinomial logit frame, the result indicates that modern contraception and abortion may be substitutes. It seems that young women in Germany either use modern contraceptives or apply abortion as a method to prevent live birth of unwanted children. Further on, family formation behaviour plays a decisive role for fertility outcomes. Women who are cohabitating are significantly more likely to give birth in the subsequent wave than experiencing an abortion. The average probability of having a live birth is increased by 0.390 for women who already cohabit with their partner. The fact that married women may have significantly more miscarriages may partly be explained by their increased intentions to become a mother. Women marry in order to start a family. They will then have higher intentions to become pregnant. But an estimated 10 to 31 percent of all pregnancies will be lost due to miscarriages (Wilcox et al 1988, Universitätsklinikum Bonn 2020).

Table 2-4 Adolescent's religion predicting transition to first fertility event: live birth, miscarriage, abortion – Multinomial logit estimations

		1	2
First fertility event		Live birth	Miscarriage
Catholic ⁽¹⁾		0.588 [0.096] (0.61)	0.166 [-0.006] (0.18)
Protestant ⁽¹⁾		1.854* [0.370] (1.98)	0.434 [-0.085] (0.52)
Islam ⁽¹⁾		0.795 [0.258] (0.52)	-15.410*** [-0.284] (-11.91)
Age anchor		-0.204 [-0.144] (-0.10)	1.903 [0.253] (0.86)
Age anchor squared		0.004 [0.003] (0.07)	-0.045 [-0.006] (-0.80)
Enrolment in education		-0.050 [-0.010] (-0.87)	-0.020 [-0.000] (-0.33)
maternal educational attainment ⁽²⁾	no upper education	0.333 [0.121] (0.33)	-0.788 [-0.142] (-0.72)
	upper education	-0.350 [-0.034] (-0.31)	-0.541 [-0.076] (-0.42)
paternal educational attainment ⁽²⁾	no upper education	0.692 [0.199] (0.87)	-0.945 [-0.176] (-1.20)
	upper education	0.010 [0.024] (0.01)	-0.390 [-0.072] (-0.35)
Residence in East Germany		1.689+ [0.413] (1.92)	-0.631 [-0.167] (-0.80)
Years of sexual activity		-0.044 [-0.014] (-0.28)	0.072 [0.011] (0.51)
No modern contraception		-2.009** [-0.428] (-3.06)	-0.466 [0.044] (-0.74)

Having partner ⁽³⁾	-0.450 [-0.085] (-0.75)	-0.0441 [0.011] (-0.07)
Cohabiting ⁽³⁾	1.715+ [0.390] (1.81)	0.318 [-0.059] (0.33)
Married ⁽³⁾	2.036 [-0.308] (1.59)	17.090*** [0.867] (12.06)
Constant	1.161 (0.06)	-19.22 (-0.89)
Observations	103	
ll	-87.28	

Abortion = Reference category. (1) Religion Reference = no denomination (2) Parental education Reference = missing information (3) Relationship Reference = single. Z-statistics in parenthesis. Z-values clustered at individual level. Average marginal effects in square brackets. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. Note: excluding 5 observations that reported abortion and miscarriages in same periods.

Figure 2-1 illustrates that the predicted probabilities of Protestants to have a live birth, compared to have an abortion, are higher than for Catholics, Muslims or non-religious women. The fertility pattern of Catholics at this point is contrary to theoretical predictions. The Catholic pro-life teaching would rather suggest that their fertility patterns are distinctive from non-religious women. Once being pregnant, the likeliness of live birth should be higher for Catholic women than for non-religious women. Instead, the probability of having the pregnancy outcome live birth is not significantly different for Catholics and non-religious women.

Figure 2-1 Predicted Probabilities for having a live birth (compared to having an abortion) for different denominational groups

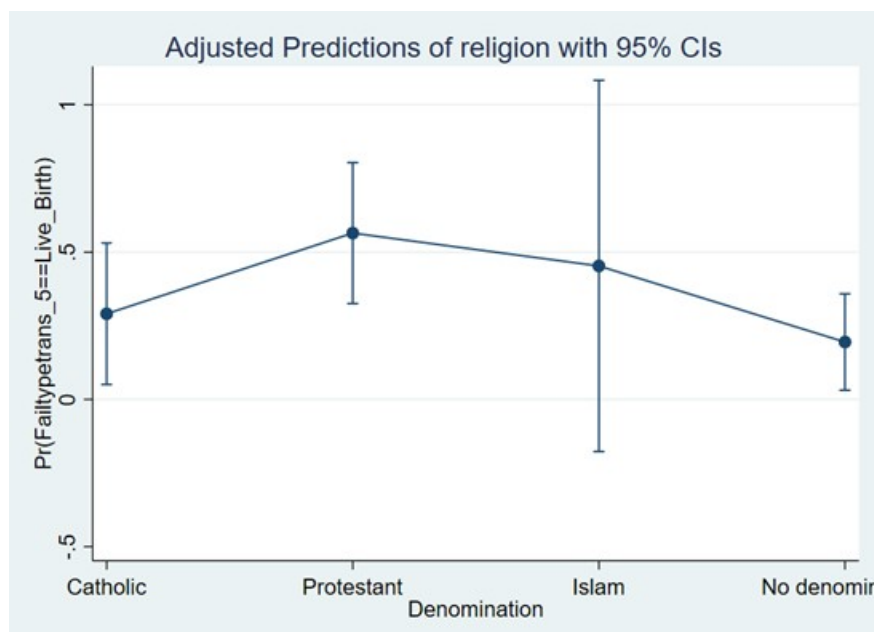


Figure 2-2 illustrates the lower predicted probabilities of Muslim women to have a miscarriage, compared to having an abortion. However, because miscarriage is an event that is assumed not to be induced on purpose, the following estimations will exclude this fertility outcome.

Predicted Probabilities for having a miscarriage (compared to having an abortion) for different denominational groups

Figure 2-2 Predicted Probabilities for having a miscarriage (compared to having an abortion) for different denominational groups

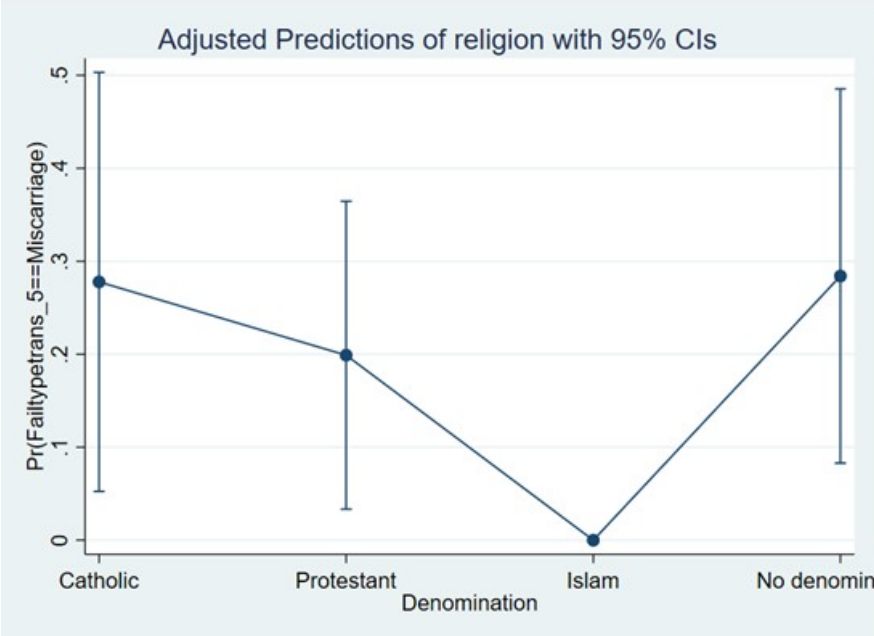


Table 2-5 present the logit estimations of having an abortion compared to having a live birth in the subsequent wave. Live birth and abortion are fertility events that result after a decision-making process. After becoming pregnant, the women can decide either carrying the pregnancy to term and having a live birth or terminating the pregnancy via abortion. This decision-making is highly influenced by social norms, values and individual preferences. According to the estimations, religion does indeed seem to play a role in this decision-making process. After controlling for direct and indirect fertility determinants, Protestant women are significantly less likely to terminate their pregnancy via abortion. The average probability of having an abortion is decreased by 44 percentage points for Protestant women compared to non-religious women. Interestingly, the Protestant coefficient becomes stronger as further controls are accounted for. For Catholic and Muslim women, the probability to have an abortion does not differ significantly from those women who report being non-religious. Residence in West or East Germany also plays an important role in the probability of abortion. The estimation shows that the likelihood to have an abortion is significantly decreased if the woman lives in East Germany, their average probability is decreased by 44 percentage points.

Results of the logit estimation in table 2-5, similarly to the estimations of the multinomial logit in table 2-4, hint to the fact that modern contraceptives and abortions are substitutes. If the woman did not apply modern contraceptives, the likelihood of abortion is significantly increased by almost 50 percentage points. The other way around, if the woman uses modern and safe contraceptives, there is less need to terminate an unwanted pregnancy via abortion. Similar to the estimations on the likelihood of pregnancy and different pregnancy outcomes, the family formation process plays a decisive role in the estimations of table 2-5. Many women aged 16 to 26 do have a partner. At the same time, only a minority of them is already married. However, cohabitation is a strong predictor for carrying a pregnancy to term compared to terminating an existing pregnancy via abortion. The results show that cohabitation is an important kick-off for childbearing. If pregnant, the average probability of cohabitating women to have an abortion is reduced by 41 percentage points.

Table 2.5 – Adolescent’s religion predicting transition to first fertility event: live birth, abortion – Logit estimations

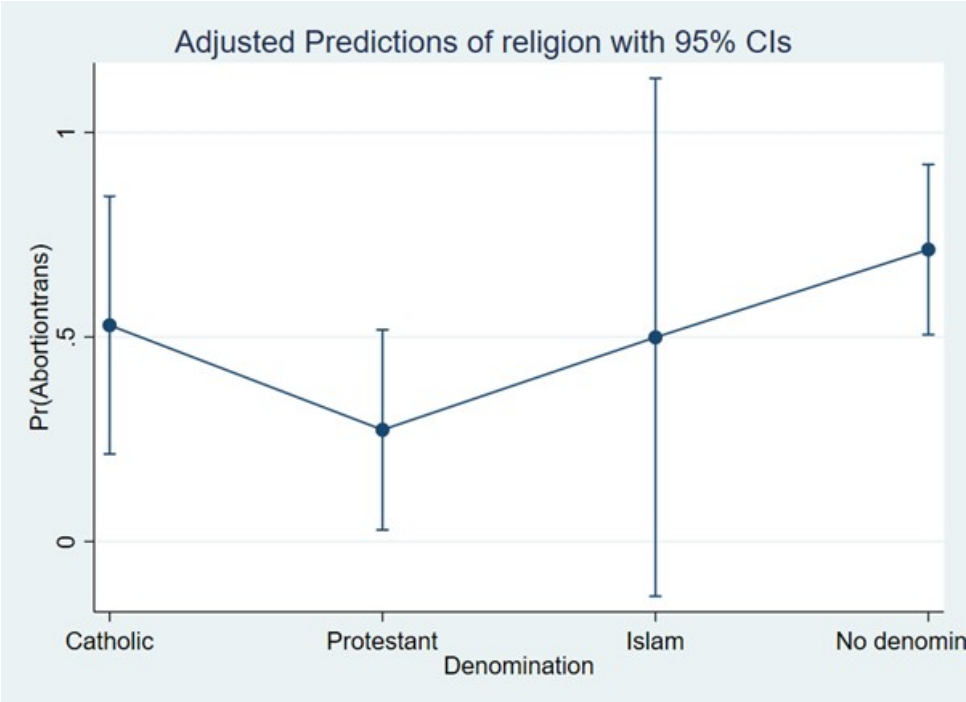
Abortion		1	2	3	4	5
		Abortion	Abortion	Abortion	Abortion	Abortion
Catholic ⁽¹⁾		0.323 (0.58)	0.343 (0.57)	-0.400 (-0.47)	-0.510 (-0.49)	-0.798 (-0.84) [-0.185]
Protestant ⁽¹⁾		-0.414 (-0.68)	-0.274 (-0.44)	-0.869 (-1.00)	-1.342 (-1.45)	-1.892* (-2.03) [-0.440]
Islam ⁽¹⁾		0.243 (0.25)	0.365 (0.37)	-0.403 (-0.34)	-0.549 (-0.35)	-0.916 (-0.60) [-0.214]
Age anchor			-1.413 (-0.76)	-1.542 (-0.85)	0.0815 (0.04)	0.649 (0.28) [0.159]
Age anchor squared			0.035 (0.73)	0.038 (0.82)	-0.004 (-0.07)	-0.016 (-0.27) [-0.004]
Enrolment in education			-0.004 (-0.09)	-0.0004 (-0.01)	0.060 (1.07)	0.066 (1.07) [0.016]
maternal educational attainment ⁽²⁾	no upper education		-0.163 (-0.19)	-0.123 (-0.14)	0.053 (0.06)	-0.734 (-0.68) [-0.175]
	upper education		-0.007 (-0.01)	0.137 (0.11)	0.615 (0.47)	0.400 (0.30) [0.080]
paternal educational attainment ⁽²⁾	no upper education		-0.224 (-0.36)	-0.294 (-0.48)	-0.794 (-1.06)	-0.641 (-0.78) [-0.153]

	upper education		0.859 (0.66)	0.721 (0.53)	0.150 (0.11)	-0.132 (-0.10) [-0.030]
Residence in East Germany				-0.914 (-1.17)	-1.344 (-1.64)	-1.779* (-2.00) [-0.437]
Years of sexual activity					0.012 (0.08)	0.070 (0.46) [0.017]
No modern contraception					2.244*** (3.43)	2.024** (3.15) [0.498]
Having partner ⁽³⁾						0.541 (0.90) [0.120]
Cohabiting ⁽³⁾						-1.861+ (-1.77) [-0.413]
Constant			0.163 (0.49)	14.48 (0.80)	16.53 (0.93)	0.471 (0.02)
Observations			79	79	79	79
ll			-53.81	-52.15	-51.44	-44.88

(1) Religion Reference = no denomination (2) Parental education Reference = missing information (3) Relationship Reference = single. Z-statistics in parenthesis. Z-values clustered at individual level. Average marginal effects in square brackets. + p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

Figure 2-3 illustrates that the predicted probabilities of having an abortion are lower for Protestants than for Catholics, Muslims or non-religious women. This again is a surprising finding. In the Catholic Church, abortion is condemned. Protestant and Muslim teaching also favours live birth as the outcome of a pregnancy. However, Protestantism and Islam are less restrictive than Catholicism with respect to abortion issues. In line with Catholic teaching, the probability of abortions should be lower for Catholic women than for Protestant and Muslim women and it should be explicitly lower than for non-religious women.

Figure 2-3 Predicted Probabilities for having an abortion (compared to having a live birth) for different denominational groups



The findings can be summed up as following: First, religion continues to have influence on fertility behaviour of young women in Germany. This is especially true for Protestant women. Protestant young women in Germany delay their first pregnancy compared to non-religious women. However, once being pregnant, Protestant women are more likely to carry their first pregnancy to term and they are less likely to terminate their first pregnancy via abortion. Muslim women in Germany are much younger when they are pregnant for the first time. But once being pregnant, the probability for Muslim women to have a live birth or to have an abortion does not differ significantly from that of non-religious women. An interesting finding is the reduced likelihood of miscarriages for Muslim women which may be drawn to reduced alcohol consume prior to and during pregnancy. It would be interesting to confirm this result on the basis of analysis with larger Muslim subpopulations. Fertility behaviour of Catholic women does not differ significantly from that of non-religious women. The Catholic coefficients throughout all estimations were only significant in the reduced model. But after accounting for further controls, the difference between Catholic and non-religious women could be explained away. Theoretically, one would expect that fertility behaviour of Catholic women differs from that of non-religious women because of the pro-life thinking of the Catholic Church. Particularly, once being pregnant, the likeliness of live birth should be higher for Catholic women than for non-religious women. The probability of abortions should be lower for Catholic women than for Protestant and Muslim women and it should be explicitly lower than for non-religious women. Instead, Catholic women are equally likely as non-religious women to become pregnant, to have an

abortion or to have live births at the beginning of their fertility biography. Solely for Protestant women, the fertility behaviour differs significantly from that of non-religious women. The multinomial estimations on the different pregnancy outcomes reveal that women who do not use modern contraceptives are significantly less likely to have a live birth compared to having an abortion. At first glance, it seems counterintuitive, that unsafe contraception leads to fewer live births. However, within the multinomial logit frame, the result indicates that modern contraception and abortion may be substitutes. It seems that young women in Germany either use modern contraceptives or apply abortion as a method to prevent live birth of unwanted children. Finally, the role of family formation within the fertility process has changed over the last decades. Up to the 1960s and 1970s, marriage was a prerequisite for starting a family and having children. Many research proofs that this social norm has been eroded. In line with former research, all estimations throughout this paper, detect cohabitation as the major determinant for becoming pregnant. It is not the fact of having a partner or being married that is influential. Instead, living together seems to be the most important step for contemporary family formation of young women in Germany. Cohabiting also plays an important role in the decision whether to carry the pregnancy out to term or to have an abortion.

Various tests check the robustness of the results. In order to account for the possibility that religion effects resemble a woman's higher or lower intention to become mother, all models additionally controlled for fertility intentions during the past year and upcoming two years. After controlling for fertility intentions, the religion effects remained robust (results not shown). Then, a considerable number of women get married between the time of conception and delivery. However, the results remained robust after controlling for those shotgun-marriages (results not shown). Possible self-selection of the young women into a denominational group and its adverse effect on estimation results are of minor relevance for two reasons. First, for the majority of young women, denomination is rather inherited by their parents than self-selected. Second, the share of women that convert from one denominational group to another within the observation period is about 1 percent low.

2.5 Conclusion

The findings of the present paper extend earlier analyses by using prospective data and taking other fertility events (abortions, miscarriages) into account rather than limiting the analysis to births. The key findings are the following.

First, despite declining religiosity levels, religion still shapes fertility patterns of young women in Germany. This decision-making of having a live birth or having an abortion is highly influenced by social norms, values and individual preferences. According to the estimations, religion does indeed seem to play a role in this decision-making process. This is especially true for Protestant women. Protestant women behave in a way that delays their first pregnancy. But once being pregnant, Protestant women show more pro-native tendency because they are more likely to carry their first pregnancy to term rather than having an abortion. After controlling for sexual activity, contraceptive use and relationship status, Protestant women are significantly less likely to terminate their pregnancy via abortion. Muslim women in Germany are much younger when they become pregnant for the first time. But once being pregnant, the probability for Muslim women to have a live birth or to have an abortion does not differ significantly from that of non-religious women. Surprising is that Catholic women have a similar chance of becoming pregnant as non-religious women. Further on, once being pregnant, the pregnancy outcomes of Catholic women do not differ significantly from that of non-religious women. For Catholic (and also Muslim) women, the probability to have an abortion does not differ significantly from those women who report being non-religious.

Theoretically, there are important moral objections of Catholics towards abortions. Catholic doctrine puts clear guidelines for fertility-related behaviour like sexual activity, contraceptive behaviour and abortions. However, the data rather suggest that these objections do not transform into the decision-making of Catholic young women in Germany. If the Catholic norms were still valid for young women, they could lead to distinctive behaviour between Catholics and Protestants. At least, they should lead to distinctive fertility behaviour between Catholics and non-religious women. However, it seems that the more liberal Protestant guidelines are valid for young Protestant women: Protestant women are significantly less likely to become pregnant, they are significantly more likely to carry their first pregnancy to term and they are significantly less likely to abort.

Second, differences between women living in East and West Germany remain striking. The residence plays a decisive role in the outcome of a pregnancy. Women in East Germany are much more likely to have a live birth compared to an abortion than women in West Germany. The estimation in table 2-5 shows that the likelihood to abort the first pregnancy is significantly decreased if the woman lives in East Germany, their average probability is decreased by 44 percentage points. This result fits those of Cygan-Rehm and Riphahn (2014) who show with data from German Federal Statistics Office that the share of abortions in all teen pregnancies (sum of births and abortions) is higher in West Germany (45 percent) than in East Germany (36 percent). The authors follow that the differences in East and West German teen birth outcomes are due to different levels of teenage pregnancies rather than to different abortion patterns. However, the results of the

present paper would rather suggest that these differences are due to distinctive decision-making after becoming pregnant. East and West German women did not differ in the incidence to become pregnant, but in the incidence to abort. This in turn compares to the results of Federal Centre for Health Education (Helfferich et al. 2016) where in West Germany, there are more abortions detected at the beginning of the woman's fertile period and where in East Germany, there are more abortions after having completed the desired number of children.

Third, the changing role of family formation within the fertility process has become evident. Marriage is no longer the most important step to start a family. In contemporary Germany, cohabitating turns out to be a more important predictor for first pregnancy than marriage.

The strength of this paper is the prospective design of the fertility history of the women aged 16 to 26. The exact temporal ordering of events is much more precise than in retrospective surveys. Reverse causality, thus, should not be the main issue throughout the analysis. Despite secularization in Germany throughout the last decades, there has been a tendency of increased pluralisation of religion. The share of persons who do not belong to the Protestant or Catholic Church has increased. This is partly due to increased immigration to Germany from Muslim-majority countries. This development may intensify the relationship between religion and fertility behaviour in the future. The present paper focuses on women who are at the beginning of their fertility biography. It cannot draw conclusions on their ongoing or completed fertility – a limitation which invites future research.

3 Big Five Personality Traits and Sex

Abstract: Sexual well-being plays an important role in the quality of life. Against this background, we provide an economics-based approach to the relationship between the Big Five personality traits and various dimensions of sexuality. From a theoretical viewpoint, personality influences sexual well-being not only by how a person feels about sex, but also by how the person behaves in a sexual relationship. Personality shapes information sharing about sexual preferences, the way dissonant sexual preferences of the partners are handled, and the extent to which the person is committed to promises made to the partner. Using a large representative dataset from Germany, we find that personality traits play a role in a person's own sexual satisfaction, in (the self-assessment of) fulfilling the partner's sexual needs and desires, in sexual communication, in actual and desired frequency of sex, and in extradyadic affairs.

Keywords: Big Five Personality Traits, Sexual Satisfaction, Frequency of Intercourse, Sexual Infidelity, Sexual Communication, Family Economics.

JEL: D10, D91, J10, J12.

This chapter is joint work with Uwe Jirjahn.

3.1 Introduction

Sex is an essential component of romantic relationships and quality of life. As suggested by a time diary study conducted by Kahneman et al. (2004), sex is the highest ranked activity in terms of net positive emotional affect even though it occupies a relatively small fraction of total time. Sexual well-being is associated with relational satisfaction, relationship stability and happiness in general (Blanchflower and Oswald 2004, Cheng and Smyth 2015, Laumann et al. 2006, Rainer and Smith 2012, Schmiedeberg et al. 2017, Sprecher 2002). Sexual well-being is also of high political interest. The World Health Organization (2006) emphasizes that improving sexual health (i.e., a state of physical, emotional, and social well-being in relation to sexuality) remains a public health priority across the globe.

The importance of sex for quality of life gives rise to the question of which factors influence sexual well-being. Our analysis addresses this question by examining the influence of personality traits on various aspects of sexuality. We focus on the Big Five model, the most widely accepted model of personality trait structure (John et al. 2008, McCrae and Costa 2008). The Big Five personality traits are extraversion, openness to experience, conscientiousness, agreeableness and neuroticism. We examine the role of these personality traits in a person's own sexual satisfaction. Moreover, in order to obtain insights into possible transmission channels through which personality shapes sexuality, we also analyze the influence of the Big Five personality traits on sexual fulfillment of the partner, sexual communication, actual and desired frequency of intercourse, and extradyadic affairs.

Our study contributes in several ways to the economic literature. While economists have been increasingly interested in the determinants of people's well-being (see Frey 2008 and Frey and Stutzer 2002 for surveys), sex has remained an under-researched topic in economics. A few economic studies have examined the link between sex and happiness (Blanchflower and Oswald 2004, Cheng and Smyth 2015, Loewenstein et al. 2015, Rainer and Smith 2012). Those studies have not considered the role of personality traits in sexual well-being. Our study emphasizes the importance of personality for sexual well-being and provides broader insights into various dimensions of sexuality.

On a broader scale, we also address a general research gap in family economics. Apart from some notable exceptions (Averett et al. 2020, Boxho et al. 2020, Dupuy and Galichon 2014, Flinn et al. 2018, Lundberg 2011, 2012), studies in family economics have paid little attention to the personality of partners as a determinant of the surplus of romantic relationships. This contrasts with studies in labor economics where a rapidly increasing body of research has examined the influence of personality traits on human capital formation and labor market outcomes (Almlund et al. 2011,

Borghans et al. 2008). This development in labor market research has been identified as ‘one of the most exciting developments in labor economics over the past decade’ (Cobb-Clark 2015: p. 1). Our study suggests that considering personality traits may lead to a similarly exciting development in family economics.

The link between personality and sex is a topic typically examined by psychologists (Allen 2019, Allen and Walter 2018). Against this background, our study follows a trend in economics to expand its scope of inquiry to topics traditionally addressed by other scientific disciplines. Of course, expanding the boundaries of economics into other social sciences by using larger and representative datasets or examining explanatory variables with greater statistical sophistication would be of limited value if it does not yield additional theoretical insights. A successful expansion of the scope of inquiry into nontraditional topics requires incorporating the new topics into economic thinking (Lazear 2000). Thus, to guide our empirical analysis, we provide an informal theoretical background discussion that integrates the psychological topic into the analytical framework of economics and, particularly, relates the topic to family economics.

Considering the dual role of personality, we argue that personality is not only a parameter shaping a person’s sexual preferences. Personality is also a parameter shaping the person’s behavior in a sexual relationship. Therefore, personality influences sexual well-being through how the person behaves in the sexual relationship. First, it shapes communication and information sharing about sexual preferences. Communication helps reduce partners’ incomplete information about each other’s sexual preferences so they can coordinate on their preferences and realize a win-win situation. Second, personality influences how dissonant preferences of the partners are handled. If partners have partially dissonant sexual preferences, there are different ways of handling these dissonant preferences. On the one hand, altruism may reduce the degree of disagreement. On the other hand, partners may bargain over their sexual activities. Personality shapes a person’s altruistic behavior, bargaining tactics and bargaining power. Third, personality influences how commitment problems are solved. A person may promise to be faithful to the partner or to practice or relinquish specific sexual practices, but later may be tempted to break the promise. The person’s commitment to the promise depends on his or her self-control, fair-mindedness, inclination to comply with norms, and willingness to reciprocate the partner’s cooperative behavior.

Our empirical analysis uses the pairfam (Panel Analysis of Intimate Relationships and Family Dynamics), a large representative dataset from Germany, to examine the link between the Big Five personality traits and sexuality. The results provide evidence that the Big Five personality traits play an important role in the sex life of people. Our estimations show that personality traits have an influence on a person’s own sexual satisfaction. Moreover, conforming to the notion that personality

shapes the behavior in a sexual relationship, our results suggest that personality traits also play a role in the sexual fulfillment of the partner. Thus, personality not only influences a person's own sexual well-being, but also the sexual well-being of the partner. Examining possible transmission channels through which personality has an impact on people's sexual well-being, we show that personality traits are associated with frequency of sex, sexual communication and extradyadic affairs.

Our estimations show that neuroticism (emotional instability) is detrimental to people's sex life. Neuroticism has a negative influence on own sexual satisfaction, sexual fulfillment of the partner, and frequency of sex. Poor sexual communication appears to be one transmission channel. Furthermore, neuroticism is associated with a higher likelihood of extradyadic affairs suggesting that lower self-control and a higher discounting of the future entail more severe commitment problems.

By contrast, a person's conscientiousness appears to help realize a win-win situation within a sexual relationship. Conscientiousness is positively associated with own sexual satisfaction in general, satisfaction with the actual frequency of sex, and sexual fulfillment of the partner. The findings conform to the notion that conscientiousness contributes to a more balanced style of sexual communication, a more cooperative handling of dissonant sexual preferences, and a higher commitment to promises made to the partner. Indeed, our results confirm that conscientiousness is positively associated with better sexual communication and a lower probability of extradyadic affairs.

Extraversion and openness to experience are also positively linked to own sexual satisfaction, sexual fulfillment of the partner and better sexual communication. However, we find no evidence that these two personality traits have a commitment value. Quite the contrary, extraversion is associated with a higher likelihood of having extradyadic affairs. This indicates that an extroverted person has better outside options. Better outside options may not only entail more severe commitment problems. They may also imply an increased bargaining power of the person within the sexual relationship.

In contrast to extraversion, agreeableness has a negative influence on the likelihood of extradyadic affairs. Thus, similar to conscientiousness, agreeableness has a commitment value. However, agreeableness does not appear to contribute to better sexual communication. Quite the contrary, the estimations provide some evidence that agreeableness is negatively associated with expressing preferences during sex. A stronger desire for harmony and a higher degree of altruism may imply that an agreeable person to some extent sacrifices his or her personal needs. Nonetheless agreeableness is positively associated with a person's own sexual satisfaction. More altruism and humility may imply that an agreeable person gains sexual satisfaction even if he or she sacrifices some of his or her needs.

While many of the results hold for both women and men, our analysis also provides evidence of some interesting gender differences in the relationship between personality and sexuality. We argue that asymmetric gender roles and a sexual double standard to some extent play a moderating role in the relationship between personality and sex.

The rest of the paper is organized as follows. Section 2 provides the theoretical background discussion. Section 3 describes the data and variables. Section 4 presents the empirical results. Section 5 discusses the results in light of our theoretical considerations. Section 6 concludes.

3.2 Background Discussion

In what follows, we set the stage by providing a brief introduction into the Big Five model. We proceed with a theoretical discussion on the transmission channels through which the Big Five personality traits can influence sexuality. Developing an economics-based approach, we first describe general transmission channels and then relate the Big Five personality traits to these channels.

3.2.1 The Big Five Personality Traits

Psychologists view personality as enduring patterns of feelings, thoughts and behaviors (Roberts 2009). Personality reflects the tendency of a person to respond in certain ways under certain circumstances. The most widely shared taxonomy of personality traits in psychology is the Big Five model (John et al. 2008, McCrae and Costa 2008). The Big Five model originated in Allport and Odbert's (1936) lexical approach positing that individual differences in personality are encoded in language. Analyzing personality-describing words, psychologists concluded that personality traits can be organized into five dimensions. Since Goldberg (1981), the five dimensions of personality have been known as the Big Five. The Big Five personality traits are extraversion, openness to experience, conscientiousness, agreeableness, and neuroticism. These personality traits have high predictive power for a series of important life outcomes such as educational achievement, job performance, health, mortality, criminality, and divorce (Almlund et al. 2011, Borghans et al. 2008, Roberts et al. 2007).

Extraversion reflects the degree to which a person orients his or her interests and energies toward the outer world of people; i.e., toward social attention and social interaction. Persons with a higher degree of extraversion tend to be characterized by warmth, sociability, assertiveness, activity, excitement seeking, and positive affect.

Openness to experience reflects the degree to which a person is open to change, variety, intellectual stimulation, and new cultural experiences. Persons with a higher degree of openness tend to be characterized by fantasy, aesthetics, and ideas.

Conscientiousness reflects the degree to which a person is willing to comply with conventional rules, standards and norms. Persons with a higher degree of conscientiousness tend to be characterized by order, dutifulness, achievement striving, self-discipline, and deliberation.

Agreeableness reflects the degree to which a person needs pleasant and harmonious relations with others. Persons with a higher degree of agreeableness tend to be characterized by trust, straight-forwardness, cooperativeness, altruism, compliance, modesty, and tender-mindedness.

Neuroticism (emotional instability) reflects the degree to which a person experiences the world as threatening and beyond his or her control. Persons with a higher degree of neuroticism tend to be characterized by anxiety, angry hostility, psychological distress, self-consciousness, impulsiveness, and vulnerability.

It is important to note that the Big Five not only influence how a person, in general, feels about the world. The Big Five are also dispositional traits influencing the overall style of the person's adjustment to and engagement of the social world (Buss 1996, Goldberg 1981, McAdams and Pals 2006, Nettle 2006). These traits describe the degree in which the person is able to solve social adaptive problems through communication, cooperation, trust, stability, and dominance.

Similarly, economists emphasize that personality traits play dual roles (Borghans et al. 2008). On the one hand, they can be a source of pleasure; i.e., they influence the utility a person derives from social relationships. On the other hand, personality traits can be viewed as capacities and constraints in the choices the person makes. These choices, in turn, have consequences for the quality of social relationships.

At issue is how personality traits influence sexuality. In what follows, we first provide a general discussion on the transmission mechanisms through which personality may have an effect on sexuality. The discussion is developed within an economics-based approach to integrate this psychological topic into the analytical framework of economics and, in particular, to relate it to family economics. Building from that discussion, we derive specific implications for the link between the Big Five personality traits and sexuality.

3.2.2 An Economics-Based Approach to Personality and Sex

The dual role of personality also applies to sexuality. On the one hand, personality can influence how much a person enjoys sex. Thus, from the viewpoint of economics, personality has an influence on the utility a person derives from sex. Personality can be seen as a parameter that shapes the

utility functions of people.¹ To the extent people differ in their personality, they will have heterogeneous preferences for sex. Depending on personality, sex will be of higher utility for some people than for others.

On the other hand, personality is a parameter shaping a person's behavior in a sexual relationship. This behavior has an influence on the quantity and quality of sex and, hence, on the extent of sexual fulfillment in the relationship. Thus, personality influences the utility from sex through how the person behaves in the sexual relationship. The person's behavior in the sexual relationship is important for at least three reasons. First, it influences communication and information sharing about sexual preferences. Second, it influences how dissonant preferences of the partners are handled. Third, it influences how commitment problems are solved.

Sexual relationships can suffer from information asymmetries (Rainer and Smith 2012). If partners have incomplete information about each other's needs and desires, they may fail to coordinate on their preferences resulting in a suboptimal sex life. Communication helps partners reduce incomplete information about their sexual preferences. By talking and listening, partners can share information about each other's preferences for sexual practices, frequency of intercourse, or timing of orgasm. This may allow them to find sexual activities working best for them and, hence, resulting in higher mutual sexual satisfaction. However, successful sexual communication requires communication skills. Personality can play a role in sexual communication. Personality influences a person's willingness to talk about own preferences and to listen to the partner. Moreover, it has an influence on whether the style of communication is characterized by warmth and empathy or by hostility and impulsiveness.

At best, partners have compatible preferences for sex so couples with strong communicative skills can realize a sex life that is more satisfying to both of them. But when partners have partially dissonant preferences (e.g. for oral sex, anal sex, timing of orgasm, frequency of intercourse, or pornography consumption), the question arises as to how they handle these dissonant preferences. One possibility is that altruism reduces the degree of disagreement. Altruism can be modeled as an interdependency of utility functions (see Bergstrom 1997 and Weiss 1997 for surveys). If a person not only cares about his or her own sexual enjoyment, but also about the partner's enjoyment, he or she will take the partner's preferences for sexual activities into account. This can be seen as a gift given to the partner. On the one hand, an altruistic person to some extent sacrifices his or her utility by forgoing some preferred sexual activities or engaging in activities only preferred by the partner. On the other hand, the altruistic person derives utility from the partner's sexual enjoyment. Moreover, if altruism leads to reciprocal gift exchange, a couple may realize higher mutual sexual satisfaction. Of course, people can differ in the degree of altruistic behavior and personality has an

influence on that degree. Thus, it depends on the partners' personalities whether altruism can solve the problem of dissonant sexual preferences.

It appears to be reasonable to assume that, in general, people are not completely altruistic, but to a greater or lesser extent also exhibit self-interest and care about their own sexual enjoyment. Family economics assumes that dissonant preferences of self-interested household members lead to an intra-household bargaining situation (see Agarwal 1997 and Lundberg and Pollak 1996 for surveys). This approach can also be applied to sexual preferences. Partners may solve the problem of dissonant sexual preferences by bargaining over their sexual activities. Personality has an influence on a person's bargaining strength and, hence, on whether he or she can achieve a favorable bargaining outcome. Assertiveness is likely to be associated with a more favorable bargaining outcome for the person while a high willingness to compromise may rather result in a less favorable outcome. In particular, personality may have an influence on the person's threat point. A more sociable person with better communication skills may have better opportunities to find a new partner in case of a disagreement. Better outside options increase the person's bargaining position in the current relationship and help get through his or her preferred sexual activities.

If partners reach a bargaining agreement on their sexual activities, commitment problems arise. A person may promise to be faithful to the partner or to practice or relinquish specific activities, but later may be tempted to break the promise. Bargaining outcomes on sexual activities cannot be made binding through legal enforcement. Thus, the question is if there are other mechanisms ensuring that promises made to the partner are kept. An agreement may be self-enforcing in a repeated game setting (Lundberg and Pollak 1994). In a repeated game setting, partners reward each other's cooperative behavior and threaten to punish opportunistic behavior by refusing cooperation in the future. However, repeated games do not always work. A person is only deterred from opportunistic behavior if he or she does not discount the future loss of cooperation too much. Moreover, repeated games involve multiple equilibria; i.e., not only mutual cooperative behavior is an equilibrium, but also mutual opportunism. We suggest that personality is a parameter playing an important role in whether or not an agreement on sexual activities is self-enforcing. On the one hand, a person's fair-mindedness, inclination to comply with norms, and willingness to reciprocate the partner's cooperative behavior increases his or her commitment to the agreement. On the other hand, sociability and communication skills may lead to alternative outside options increasing the temptation to engage in opportunistic behavior.

3.2.3 Implications for the Link between Big Five Personality Traits and Sex

In our empirical analysis, we examine the link between the Big Five personality traits and sexual satisfaction. Considering the dual role of personality, the Big Five may not only have an impact on sexual satisfaction by shaping a person's utility function; i.e., by influencing the pleasure the person enjoys from sexual activities. The Big Five may also have an impact through the person's behavior in a sexual relationship and, hence, through the sexual activities the couple do together. In order to gain insights into the transmission channels through which the Big Five have an influence on sexual satisfaction, we also examine a series of behavioral outcome variables. We analyze the determinants of sexual communication. This gives us insights into the role of information sharing in sexual relationships. Furthermore, we examine the degree in which a person meets the partner's needs. This provides indications of whether a person can realize a win-win situation within the sexual relationship. Moreover, we consider the actual and the desired frequency of intercourse. Finally, we examine if a person has sex with someone other than the partner. This provides insights into how the Big Five influence commitment problems and the outside options of the person.

Extraversion and openness to experience should be positively associated with sexual satisfaction. One transmission channel through which these personality traits influence sexual satisfaction is better communication with the partner. Better communication enables a more extroverted and open person to express his or her sexual preferences so that the partner can take into account these preferences. Better communication also implies that the person obtains more information about the partner's preferences so that a win-win situation may be realized. However, greater communication skills make it also easier to get in contact with other potential partners meaning that a more extroverted and open person has better outside options. Better outside options increase the person's bargaining position. While this provides the second transmission channel through which extraversion and openness should result in higher sexual satisfaction, it makes the implications for the partner's sexual fulfillment ambiguous. A more extroverted and open person may get through his or her preferred sexual activities at the expense of the partner's needs and desires. Better outside options may also result in more severe commitment problems. A more extroverted and open person with better outside options may be more tempted to breach an agreement with the partner and to have sex with someone other.

By contrast, conscientiousness can be expected to have a commitment value in a sexual relationship. A higher degree of conscientiousness is associated with greater self-control, sense of responsibility, and dependability. A more conscientious person is rule abiding and has a stronger focus on the long-term relationship. Thus, a more conscientious person should be more likely to resist short-term temptations and to keep promises made to the partner. To the extent this induces a

more cooperative behavior of the partner, a higher degree of conscientiousness can also result in increased own sexual satisfaction. Moreover, conscientiousness may contribute to a more balanced style of sexual communication leading to more successful information sharing and mutually beneficial outcomes for the partners.

Agreeableness may also contribute to more successful information sharing. An agreeable person is more empathic and tender-minded and, hence, has a more harmonious communication style allowing partners to realize a mutually beneficial sex life. Furthermore, agreeableness is positively associated with altruism (Becker et al. 2012). Thus, an agreeable person should take the partner's needs and desires to a higher degree into account. To the extent this induces positive reciprocal behavior of the partner and, hence, mutual gift exchange in the sexual relationship, a higher degree of agreeableness can result in higher own sexual satisfaction. However, when bargaining over sexual activities, an agreeable person may compromise too much for the sake of harmony. In particular, a higher degree of altruism can lead an agreeable person to sacrifice his or her sexual needs in favor of the partner's needs. This may suggest that the implications of agreeableness for own sexual satisfaction are ambiguous. Nonetheless, even if an agreeable person to some extent sacrifices his or her sexual needs, this does not necessarily imply a negative influence on sexual satisfaction. Altruism means that a person also derives utility from the partner's sexual fulfillment. Moreover, agreeableness is associated with humility (McCrae and Costa 2008, Van Kampen 2012).ⁱⁱ This could imply that an agreeable person gains sexual satisfaction even he or she sacrifices some of his or her needs.

Neuroticism can have a negative impact on sexuality for several reasons. As emphasized by Eysenck (1971, 1976), a person with a higher score on neuroticism tends to have more fears about sexuality and may be more disgusted about some aspects of sexuality. This suggests that a person with a higher score on neuroticism derives less utility from sex than someone with a lower score. Moreover, neuroticism can have a negative impact on sexual satisfaction through the person's behavior in a sexual relationship. Emotional instability tends to entail inadequate and hostile sexual communication (Velten and Margraf 2017). For example, a neurotic person may overreact to criticism triggering negative responses from the partner. This results in poor information sharing and makes it difficult to realize a mutually beneficial sex life. Furthermore, negative emotions are associated with low self-control and a high discounting of the future (Loewenstein 2000). This aggravates commitment problems. A neurotic person is more likely to feel neglect or rejection from the partner; i.e., the person believes that he or she is no longer loved. This can increase the person's propensity to seek an extradyadic sexual relationship (Josephs and Shimberg 2010).

3.3 Data and Variables

3.3.1 The Data Set

Our empirical analysis is based on data from the pairfam (Brüderl et al. 2018, Huinink et al. 2011). A handful of studies used the data to examine some aspects of sexuality (Hajek 2019, Kislev 2020, Morgan et al. 2018, Rainer and Smith 2012, Schmiedeberg et al. 2017, Schmiedeberg and Schröder 2016, Schröder and Schmiedberg 2015). However, these studies did not consider the influence of personality traits on sexuality.

Pairfam is a nationally representative panel study for Germany funded by the German Research Foundation (DFG). The focus of the pairfam study is on intimate relationships and family relations. A nucleus of themes is addressed annually. Different additional topics are sampled in consecutive waves. The survey includes both a personal interview by a professional interviewer and a self-administered questionnaire for intimate questions. The self-administered questionnaire is completed during the interview using the official survey laptop. In order to avoid interviewer effects and reporting bias, all questions on sexuality are asked in the self-administered questionnaire.ⁱⁱⁱ

The first wave of interviews was conducted in the year 2008 for three birth cohorts: adolescents born between 1991 and 1993, young adults between 1981 and 1983, and middle-aged adults born between 1971 and 1973. Addresses were randomly drawn from the local population registers of 343 randomly chosen municipalities. More than 12,000 persons participated in the first wave. The sample of the first wave has been used as the basis for the following waves. Nonresponse patterns are similar to other panel studies based on voluntary participation. Bias due to panel attrition does not appear to be a large issue (Müller and Castiglioni 2015).

For our empirical analysis, we use data from waves 2008–2017. We limit our sample to heterosexual persons who are at least 18 years old and have a partner in the respective year of observation.

3.3.2 Dependent Variables

Table 3-1 shows the definitions of the dependent variables and their descriptive statistics. The table also reports the years for which information on the various dependent variables is available.

Table 3-1 Definitions and Descriptive Statistics of the Dependent Variables

<i>Variable</i>	<i>Definition</i>	<i>Mean</i>	<i>Std.dev.</i>	<i>N</i>	<i>Years</i>
Sexual satisfaction	Score of sexual satisfaction. The interviewee answers the question “How satisfied are you with your sex life?” on an eleven-point Likert	6.614	2.518	35204	2008–2017

	scale. The scale ranges from 0 “very dissatisfied” to 10 “very satisfied”.				
Expressing preferences during sex	The interviewee responds to the statement “If I want something different during sex, I say it or show it” on a five-point Likert scale ranging from 1 “not at all” to 5 “absolutely”.	3.707	0.981	13507	2009, 2010, 2012, 2014, 2016
Expressing sexual needs and desires in general	The interviewee responds to the statement “In general, I can express my sexual needs and desires very well” on a five-point Likert scale ranging from 1 “not at all” to 5 “absolutely”.	3.654	0.937	13449	2009, 2010, 2012, 2014, 2016
Good sex partner	The interviewee responds to the statement “I am a very good sex partner” on a five-point Likert scale ranging from 1 “not at all” to 5 “absolutely”.	3.559	0.888	12948	2009, 2010, 2012, 2014, 2016
Fulfilling partner’s sexual needs and desires	The interviewee responds to the statement “In general, I can fulfill the sexual needs and desires of my partner very well” on a five-point Likert scale ranging from 1 “not at all” to 5 “at absolutely”.	3.728	0.876	13182	2009, 2010, 2012, 2014, 2016
Frequency of sex	Frequency of intercourse per month during the past three months: 0, 0.67, 2.5, 4, 10, 20 or 30 days per month.	5.838	6.105	30517	2009–2017
Desire for less frequent sex	Dummy equals 1 if the person prefers to have sex somewhat less often or much less often than he or she had during the past three months.	0.051	0.220	12911	2014–2017
Desire for more frequent sex	Dummy equals 1 if the person prefers to have sex somewhat more often or much more often than he or she had during the past three months.	0.564	0.496	12911	2014–2017
Extradyadic affair	Dummy equals 1 if the person had sex with someone other than the partner during the past two years.	0.030	0.170	11223	2010, 2012, 2014, 2016

An ordered variable for sexual satisfaction captures the utility a person derives from sex. The eleven-point Likert scale of the variable ranges from 0 ‘very dissatisfied’ to 10 ‘very satisfied’. The variable is available for the years 2008–2017.

The survey also provides information on the transmission channels through which a person’s personality traits may influence sexual satisfaction. Two ordered variables for expressing preferences during sex and expressing sexual needs and desires in general capture sexual communication. Furthermore, in order to examine the influence of personality traits on the partner’s sexual fulfillment, we consider two ordered variables for the self-assessment of whether the interviewee perceives his- or herself as being a good sex partner and being able to fulfill the partner’s needs and desires. The five-point Likert scale of the variables for sexual communication and self-esteem ranges from 1 ‘not at all’ to 5 ‘absolutely’. The variables are available for the years 2009, 2010, 2012, 2014 and 2016.

Information on frequency of intercourse is available for the years 2009–2017. Frequency of intercourse during the past three months is measured on a seven-point interval scale: Never/not in the past three months, once per month or less, 2–3 days per month, once per week, 2–3 days per week, more than 3 days per week, daily. Building from Schröder and Schmiedeberg (2015), we recode the variable to indicate frequency per month: 0, 0.67, 2.5, 4, 10, 20 and 30 days per month. This allows to apply linear regression analysis.

Information on the desired frequency of intercourse is contained in waves 2014–2017. Interviewees answer the question on whether they prefer to have less or more sex than they had during the past three months. The categories for the answers are: Much less often, somewhat less often, just as often, somewhat more often, and much more often. We define two dummy variables. The first dummy equals 1 if the person prefers to have sex somewhat less often or much less often. The second dummy equals 1 if the person prefers to have sex somewhat more often or much more often.

Finally, we consider extradyadic sexual relationships. The survey provides four categories on extradyadic affairs during the past two years: No extradyadic affairs of both partners, extradyadic affair of the partner only, extradyadic affair of the interviewee only, extradyadic affairs of both partners. We define a dummy equal to 1 if the interviewee only or both partners had an extradyadic affair during the past two years. We use information provided in waves 2010, 2012, 2014 and 2016.^{iv}

3.3.3 Key Explanatory Variables: Big Five Personality Traits

Table 3-2 shows the definitions and descriptive statistics of the variables for the Big Five personality traits.

Table 3-2 Definitions and Descriptive Statistics of the Variables for the Big Five

<i>Variable</i>	<i>Definition</i>	<i>Mean</i>	<i>Std.dev.</i>
Extraversion	Score of extraversion constructed from adding up four survey items measured on a five-point Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree”. The sum of items is divided by 4. The items are: (1) I am usually modest and reserved. (2) I get enthusiastic easily and can motivate others easily. (3) I tend to be the strong and silent type. (4) I am expansive and gregarious. Items (1) and (3) were recoded in inverse order before adding up.	3.579	0.799
Openness	Score of openness to experience constructed from adding up five survey items measured on a five-point Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree”. The sum of items is divided by 5. The items are: (1) I am interested in many kinds of things. (2) I am intellectual and like to contemplate things. (3) I am very imaginative. (4) I appreciate artistic and aesthetic impressions. (5) I am hardly interested in art. Item (5)	3.641	0.681

	was recoded in reverse order before adding up.		
Conscientiousness	Score of conscientiousness constructed from adding up four survey items measured on a five-point Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree”. The sum of items is divided by 4. The items are: (1) I complete my tasks thoroughly. (2) I make things comfortable for myself and tend to be lazy. (3) I am proficient and work fast. (4) I make plans and carry them out. Item (2) was recoded in inverse order before adding up.	3.878	0.612
Agreeableness	Score of agreeableness constructed from adding up four survey items measured on a five-point Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree”. The sum of items is divided by 4. The items are: (1) I tend to criticize others. (2) I trust others easily and believe that people are inherently good. (3) I can be cold and distanced in my behavior. (4) I can be gruff and dismissive with others. Items (1), (3) and (4) were recoded in inverse order before adding up.	3.304	0.698
Neuroticism	Score of neuroticism constructed from adding up four survey items measured on a five-point Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree”. The sum of items is divided by 4. The items are: (1) I easily become depressed or discouraged. (2) I am relaxed and don’t let myself be worried by stress. (3) I worry a lot. (4) I easily become nervous and insecure. Item (2) was recoded in reverse order before adding up.	2.659	0.787

N = 35204

As usual in large surveys (Rammstedt and John 2005, 2007, Soto and John 2017), personality is measured in the pairfam using a short version of the Big Five inventory. Extraversion, conscientiousness, agreeableness and neuroticism are assessed with four items, respectively. Openness to experience is assessed with five items. The items are measured on a five-point Likert scale ranging from 1 ‘strongly disagree’ to 5 ‘strongly agree’. For each of the five personality traits, we add up the respective items and divide the sum by the number of items.

Information on the Big Five is available in the waves 2009, 2013 and 2017. Considering a four-year window, Cobb-Clark and Schurer (2012) have shown that Big Five personality traits change only very modestly, that intra-individual changes are generally unrelated to adverse life events and that changes are not economically meaningful. Against this background, we match the information on the Big Five to the other waves of our sample. Information from wave 2009 is matched to the years 2008, 2010, 2011 and 2012. Information from 2013 is matched to the years 2014, 2015 and 2016.

3.3.4 Control Variables

Appendix Table A-1 provides the definitions and descriptive statistics of the control variables. We control for the economic situation by including variables for the years of schooling and the person’s labor market status. Demographic characteristics are captured by variables for the number of children in the household and for the person’s gender, health, religious affiliation, migration

background and age. In order to account for a nonlinear influence of age on sexuality, we also include a quadratic age variable. The type of relationship is controlled for by variables for relationship duration and being married to the partner. For persons not married to the partner, we take into account whether or not the couple lives together in the same dwelling. Moreover, as East Germans appear to have more equal gender roles than West Germans (Jirjahn and Chadi 2020), we also include a dummy for residing in East Germany. Finally, wave and cohort dummies are included in the regressions.

3.4 Empirical Analysis

3.4.1 Sexual Satisfaction

Table 3-3 shows the key results on sexual satisfaction.^v The determinants of sexual satisfaction are estimated by using the random effects ordered logit model.^{vi} The random effects model accounts for cross-period correlation of individual-specific error terms. Furthermore, we cluster the standard errors at the individual level using the Huber-White sandwich estimator. In order to provide a quantitative assessment, the table does not only provide coefficients, but also marginal effects on the probability of answering one of the three highest categories of the eleven-point Likert scale for sexual satisfaction.

Table 3-3 Determinants of Sexual Satisfaction

<i>Explanatory Variables</i>	<i>(1) All</i>	<i>(2) Only Men</i>	<i>(3) Only Women</i>
Extraversion	0.080 [0.016] (2.807)***	0.146 [0.024] (3.413)***	0.022 [0.005] (0.571)
Openness	0.049 [0.010] (1.594)	0.006 [0.001] (0.135)	0.091 [0.019] (2.183)**
Conscientiousness	0.293 [0.060] (8.609)***	0.338 [0.067] (6.759)***	0.266 [0.056] (5.720)***
Agreeableness	0.190 [0.039] (6.669)***	0.232 [0.046] (5.323)***	0.156 [0.033] (4.179)***
Neuroticism	-0.255 [-0.053] (9.001)***	-0.179 [-0.035] (3.911)***	-0.304 [-0.064] (8.446)***
Controls	Included	Included	Included
Log likelihood	-70357.120	-30809.010	-39489.040
Number of persons	7263	3288	3975
Number of observations	35204	15472	19732

Method: Random effects ordered logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. Average marginal effects in square brackets are calculated on the probability of answering one of the three highest satisfaction categories of the eleven-point Likert scale. *** Statistically significant at the 1% level; ** 5% level.

Column (1) presents the regression results for the combined sample of men and women. Four out of the five variables for personality traits take significant coefficients. Extraversion, conscientiousness and agreeableness are significantly positive determinants of sexual satisfaction while neuroticism is a significantly negative determinant. The combined sample of men and women shows no significant influence of openness to experience.

Considering the magnitudes of the associations, conscientiousness has the strongest influence on sexual satisfaction. An additional point on the one to five point scale of conscientiousness is associated with a 6 percentage point higher likelihood of reporting one of the three highest satisfaction categories. Given that we have 44 percent of observations in these categories, this implies an increase in the likelihood by 14 percent. Neuroticism has the second strongest influence. An additional point on the scale of neuroticism is associated with a 5 percentage point lower likelihood of reporting one of the three highest categories of sexual satisfaction. Taking again into account that there are 44 percent of observations in these categories, this entails a decrease in the likelihood by 11 percent. Agreeableness has the third strongest influence with 4 percentage points and extraversion the fourth strongest influence with 2 percentage points.

In order to examine whether there are gender differences in the influence of personality on sexual satisfaction, we provide separate estimations for men and women in columns (2) and (3). While the magnitudes of the influences slightly vary, the separate estimations show a similar pattern of results with respect to conscientiousness, agreeableness and neuroticism. For both men and women, conscientiousness and agreeableness are significantly positive determinants of sexual satisfaction whereas neuroticism is a significantly negative determinant. By contrast, the separate estimations show clear gender differences with respect to extraversion and openness to experience. Extraversion is a significantly positive determinant of sexual satisfaction for men, but not for women. Openness to experience is a significantly positive determinant for sexual satisfaction for women, but not for men.

3.4.2 Satisfying the Partner's Sexual Wishes

A person's personality traits may not only influence his or her own sexual satisfaction, but also the partner's sexual satisfaction. In order to examine the influence of a person's personality in the partner's sexual fulfillment, we use interviewees' self-assessments and estimate the determinants of being a good sex partner and fulfilling the partner's sexual needs and desires. Table 3-4 provides the key results of random effects ordered probit regressions.

Table 3-4 Determinants of Satisfying the Partner's Sexual Wishes

	(1) <i>All</i>	(2) <i>Only Men</i>	(3) <i>Only Women</i>
<i>Explanatory Variables</i>	<i>Being a Good Sex Partner</i>		
Extraversion	0.318 [0.064] (6.969)***	0.383 [0.071] (5.708)***	0.265 [0.055] (4.278)***
Openness	0.270 [0.054] (5.437)***	0.353 [0.065] (4.853)***	0.219 [0.046] (3.233)***
Conscientiousness	0.367 [0.074] (6.408)***	0.474 [0.088] (5.655)***	0.307 [0.064] (3.887)***
Agreeableness	0.058 [0.012] (1.239)	0.054 [0.010] (0.801)	0.071 [0.015] (1.104)
Neuroticism	-0.333 [-0.067] (7.526)***	-0.263 [-0.049] (3.966)***	-0.366 [-0.077] (6.189)***
Controls	Included	Included	Included
Log likelihood	-14476.050	-5952.455	-8440.108
Number of persons	5652	2558	3094
Number of observations	12948	5723	7225
	<i>Fulfilling Partner's Sexual Needs and Desires</i>		
Extraversion	0.349 [0.062] (8.379)***	0.440 [0.072] (7.108)***	0.273 [0.051] (4.842)***
Openness	0.305 [0.054] (6.709)***	0.290 [0.048] (4.305)***	0.324 [0.061] (5.269)***
Conscientiousness	0.429 [0.076] (8.227)***	0.511 [0.084] (6.729)***	0.383 [0.072] (5.325)***
Agreeableness	0.048 [0.009] (1.141)	0.096 [0.016] (1.543)	0.025 [0.005] (0.433)
Neuroticism	-0.226 [-0.040] (5.567)***	-0.147 [-0.024] (2.381)**	-0.264 [-0.049] (4.944)***
Controls	Included	Included	Included
Log likelihood	-14731.680	-6166.200	-8512.297
Number of persons	5725	2598	3127
Number of observations	13182	5844	7338

Method: Random effects ordered logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. Average marginal effects in square brackets are calculated on the probability of answering one of the two highest self-esteem categories of the five-point Likert scale. *** Statistically significant at the 1% level; ** 5% level.

The estimations show no significant association between agreeableness and the two indicators of the partner's sexual fulfillment. Extraversion, openness to experience and conscientiousness are significantly positive determinants of being a good sex partner and fulfilling the partner's sexual needs and desires. Neuroticism is a significantly negative determinant. The results hold for the combined sample of men and women and for the separate estimations by gender. The influences are not only statistically significant, but also quantitatively meaningful. Conscientiousness has the strongest influence. In the combined sample of men and women, an additional point on the scale of conscientiousness is associated with a 7 percentage point higher likelihood of reporting one of the two highest categories of the five-point scale for being a good sex partner. Given that we have 55

percent of observations in the two highest categories, this implies an increase in the likelihood by 13 percent.

3.4.3 Sexual Communication

In order to examine possible transmission channels we now turn to the link between personality traits and sexual communication. Table 3-5 presents the key results of random effects ordered probit regressions on the determinants of expressing preferences during sex and expressing sexual needs and desires in general.

Table 3-5 Determinants of Sexual Communication

	(1) <i>All</i>	(2) <i>Only Men</i>	(3) <i>Only Women</i>
<i>Explanatory Variables</i>	<i>Expressing Preferences during Sex</i>		
Extraversion	0.410 [0.076] (9.704)***	0.398 [0.073] (6.343)***	0.400 [0.075] (6.994)***
Openness	0.296 [0.055] (6.312)***	0.216 [0.040] (3.137)***	0.359 [0.067] (5.593)***
Conscientiousness	0.298 [0.056] (5.771)***	0.241 [0.044] (3.368)***	0.370 [0.069] (4.983)***
Agreeableness	-0.079 [-0.015] (1.809)*	-0.021 [-0.004] (0.329)	-0.135 [-0.025] (2.225)**
Neuroticism	-0.229 [-0.043] (5.489)***	-0.225 [-0.041] (3.567)***	-0.221 [-0.041] (3.966)***
Controls	Included	Included	Included
Log likelihood	-16375.930	-7082.487	-9241.700
Number of persons	5786	2624	3162
Number of observations	13507	5974	7533
	<i>Expressing Sexual Needs and Desires in General</i>		
Extraversion	0.424 [0.081] (9.696)***	0.497 [0.089] (7.581)***	0.356 [0.070] (6.086)***
Openness	0.316 [0.060] (6.593)***	0.273 [0.049] (3.883)***	0.354 [0.070] (5.430)***
Conscientiousness	0.401 [0.076] (7.567)***	0.409 [0.073] (5.352)***	0.421 [0.083] (5.714)***
Agreeableness	-0.034 [-0.006] (0.773)	-0.014 [-0.003] (0.219)	-0.051 [-0.010] (0.857)
Neuroticism	-0.273 [-0.052] (6.279)***	-0.257 [-0.046] (3.926)***	-0.270 [-0.053] (4.651)***
Controls	Included	Included	Included
Log likelihood	-15715.300	-6631.123	-9019.434
Number of persons	5776	2619	3157
Number of observations	13449	5958	7491

Method: Random effects ordered logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. Average marginal effects in square brackets are calculated on the probability of answering one of the two highest communication categories of the five-point Likert scale. *** Statistically significant at the 1% level; ** 5% level; * 10% level.

Extraversion, openness to experience and conscientiousness are positive determinants of the two indicators of sexual communication whereas neuroticism is a negative determinant. The results hold for the combined sample of men and women and for the separate estimations by gender. The influences are not only statistically significant, but also quantitatively meaningful. Extraversion has the strongest influence. In the combined sample of men and women, an additional point on the scale of extraversion is associated with an 8 percentage point higher likelihood of reporting one of the two highest categories of the five-point scale for expressing sexual needs and desires in general. Given that we have 61 percent of observations in the two highest categories, this implies an increase in the likelihood by 13 percent.

While agreeableness does not emerge with significant coefficients in the estimations on expressing sexual needs and desires in general, we find some evidence that it is a negative determinant of expressing preferences during sex. The separate estimations show that this significantly negative association only holds for women, but not for men.

3.4.4 Frequency of Sex

Previous research has shown that frequency of sex plays a role in happiness (Blanchflower and Oswald 2004, Cheng and Smyth 2015, Schmiedeberg et al. 2017). This gives rise to the question of how personality traits influence frequency of sex. Table 3-6 shows the key results of random effects GLS regressions on the determinants of frequency of intercourse per month.

Table 3-6 Determinants of Frequency of Intercourse

<i>Explanatory Variables</i>	<i>(1) All</i>	<i>(2) Only Men</i>	<i>(3) Only Women</i>
Extraversion	0.337 (5.014)***	0.468 (4.682)***	0.218 (2.416)**
Openness	0.033 (0.431)	0.018 (0.154)	0.059 (0.598)
Conscientiousness	0.093 (1.079)	0.275 (2.129)**	-0.032 (0.272)
Agreeableness	-0.021 (0.296)	-0.129 (1.149)	0.052 (0.577)
Neuroticism	-0.224 (3.395)***	-0.149 (1.405)	-0.264 (3.155)***
Controls	Included	Included	Included
R ²	0.142	0.167	0.119
Number of persons	6947	3151	3796
Number of observations	30517	13477	17040

Method: Random effects GLS. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. *** Statistically significant at the 1% level; ** 5% level.

The variables for openness to experience and agreeableness do not emerge with significant coefficients. Extraversion is a significantly positive determinant of frequency of intercourse. This result holds for the combined sample of men and women and for the separate estimations by gender. Considering the estimation with combined sample of men and women, an additional point on the scale of extraversion is associated with an increase in the frequency of intercourse by one-third day. Taking into account that the average frequency of intercourse is 6 days per month, this implies an increase in the frequency by about 6 percent. Conscientiousness is also associated with a higher frequency of intercourse. However, the separate estimations by gender show that this only holds for men. By contrast, neuroticism is associated with a lower frequency of intercourse. The separate estimations by gender indicate that this specifically holds for women.

So far we have considered the actual frequency of sex. We recognize that the desired frequency of sex may differ from the actual one (Loewenstein et al. 2015, Smith et al. 2011). Thus, using the multinomial logit approach, we estimate the determinants of desiring a lower or desiring a higher frequency of intercourse than the actual one. The reference group consists of persons who are satisfied with the actual frequency of intercourse. Table 3-7 provides the key results.

Table 3-7 Determinants of Desire for Less Frequent or More Frequent Sex

<i>Explanatory Variables</i>	(1) <i>All</i>		(2) <i>Only Men</i>		(3) <i>Only Women</i>	
	<i>Less Sex</i>	<i>More Sex</i>	<i>Less Sex</i>	<i>More Sex</i>	<i>Less Sex</i>	<i>More Sex</i>
Extraversion	-0.110 [-0.008] (1.331)	0.094 [0.024] (2.600)***	-0.159 [-0.003] (1.048)	0.081 [0.018] (1.449)	-0.097 [-0.011] (1.035)	0.124 [0.034] (2.568)**
Openness	-0.148 [-0.008] (1.697)*	0.029 [0.010] (0.728)	0.045 [0.001] (0.230)	-0.053 [-0.011] (0.833)	-0.163 [-0.015] (1.688)*	0.088 [0.027] (1.684)*
Conscientiousness	-0.130 [-0.003] (1.273)	-0.122 [-0.025] (2.597)***	-0.005 [0.001] (0.019)	-0.137 [-0.028] (1.955)*	-0.149 [-0.006] (1.321)	-0.118 [-0.023] (1.846)*
Agreeableness	-0.088 [-0.003] (1.075)	-0.059 [-0.011] (1.582)	-0.186 [-0.002] (0.887)	-0.069 [-0.012] (1.147)	-0.073 [-0.004] (0.811)	-0.037 [-0.006] (0.772)
Neuroticism	0.215 [0.006] (2.748)***	0.175 [0.035] (4.689)***	0.323 [0.003] (2.049)**	0.180 [0.034] (3.038)***	0.194 [0.007] (2.209)**	0.177 [0.036] (3.652)***
Controls	Included	Included	Included	Included	Included	Included
Log Likelihood	-10297.920		-3783.327		-6380.738	
Number of persons	4411		1971		2440	
Number of observations	12911		5745		7166	

Method: Multinomial logit. The reference group consists of persons who prefer to have sex just as often as they had during the past three months. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. Average marginal effects are in square brackets. *** Statistically significant at the 1% level; ** 5% level; * 10% level.

Extraversion is significantly associated with a higher likelihood of desiring a higher frequency of intercourse. The separate estimations by gender show that this particularly holds for women. In a similar vein, for women, openness to experience is significantly associated with a lower probability of desiring less frequent sex and a higher probability of desiring more frequent sex. Conscientiousness is a significantly negative determinant of desiring more frequent sex. This holds for the combined sample of men and women and for the separate estimations by gender. Neuroticism is significantly associated with both a higher likelihood of desiring less frequent sex and a higher likelihood of desiring more frequent sex. This pattern can be found for both men and women. The estimations show no significant influence of agreeableness.

3.4.5 Extradynamic Affairs

Finally we examine the role of personality traits in having extradynamic affairs. Table 3-8 shows the key results of random effects probit regressions. As the dependent variable captures extradynamic affairs during the last two years, we use two-year lags of the explanatory variables.

Table 3-8 Determinants of Extradynamic Affairs

<i>Explanatory Variables</i>	<i>(1) All</i>	<i>(2) Only Men</i>	<i>(3) Only Women</i>
Extraversion	0.508 [0.009] (2.877)***	0.624 [0.013] (2.729)***	0.332 [0.005] (1.538)
Openness	-0.041 [-0.001] (0.213)	0.173 [0.004] (0.743)	-0.158 [-0.003] (0.617)
Conscientiousness	-0.533 [-0.009] (2.518)**	-0.609 [-0.013] (2.382)**	-0.404 [-0.006] (1.419)
Agreeableness	-0.445 [-0.008] (2.444)**	-0.561 [-0.012] (2.454)**	-0.316 [-0.005] (1.369)
Neuroticism	0.417 [0.007] (2.290)**	0.481 [0.010] (2.104)**	0.353 [0.006] (1.532)
Controls	Included	Included	Included
Pseudo R ²	0.07	0.01	0.12
Number of persons	4927	2123	2804
Number of observations	11223	4734	6489

Method: Random effects logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. Average marginal effects are in square brackets. *** Statistically significant at the 1% level; ** 5% level.

In none of the regressions, openness to experience emerges with significant coefficients. In the regression with combined sample of men and women, extraversion and neuroticism take significantly positive coefficients while conscientiousness and agreeableness emerge with significantly negative coefficients. The influences of these personality traits are also quantitatively meaningful.

Extraversion and conscientiousness have the strongest influences. An additional point on the scale of extraversion is associated with a 1 percentage point higher likelihood of having extradyadic affairs while an additional point on the scale of conscientiousness reduces that likelihood by 1 percentage point. Given that there are 3 percent of observations with extradyadic affairs in our data, this implies a change in the likelihood of having extradyadic affairs by 33 percent. The separate regressions by gender show that the pattern of results specifically holds for men. We find no significant influence of personality on extradyadic affairs of women.

3.5 Discussion of Results

3.5.1 General Insights

Our results show that the Big Five personality traits play an important role in the sex life of people. The Big Five personality traits not only play a role in a person's sexual satisfaction. They also play a role in how the person behaves in a sexual relationship. This conforms to our theoretical considerations suggesting that personality traits influence sexual communication and information sharing, the way dissonant sexual preferences of the partners are handled, and the extent to which the person is committed to promises made to the partner.

Neuroticism is associated with lower sexual satisfaction. On the one hand, a higher degree of emotional instability may entail that a person derives less utility from sex as he or she fears sex or is disgusted about some aspects of sexuality. On the other hand, our results suggest that a higher degree of emotional instability negatively affects sexual satisfaction through the person's behavior in the sexual relationship. Neuroticism is negatively associated with (the self-assessment of) being a good sex partner and fulfilling the partner's sexual needs and desires. This indicates that a person's emotional instability also negatively affects the partner's sexual satisfaction and makes a mutually beneficial sex life less likely. Our findings on sexual communication corroborate this view. Neuroticism is negatively associated with expressing preferences during sex and the ability of expressing sexual needs and desires in general. This conforms to the notion that emotional instability entails inadequate and hostile sexual communication and information sharing. Furthermore, neuroticism is associated with a lower frequency of sex and a higher likelihood of being satisfied with the actual frequency of sex. However, a higher degree of neuroticism increases both the likelihood of desiring less frequent and the likelihood of desiring more frequent sex. This indicates that a neurotic person has rather volatile sexual preferences and is driven by impulsivity. Hence, it is more difficult for the person and the partner to coordinate their preferences and to handle dissonant preferences. Finally, our estimations show that neuroticism is associated with an increased likelihood of having

extradyadic affairs. This conforms to the notion that lower self-control and a higher discounting of the future entail more severe commitment problems.

Conscientiousness is associated with higher sexual satisfaction in general and with a higher likelihood that a person is satisfied with the actual frequency of sex. Moreover, it is also positively associated with being a good sex partner and fulfilling the partner's sexual needs and desires. Thus our findings fit the notion that a higher degree of conscientiousness helps realize a win-win situation within the sexual relationship. As suggested by our theoretical considerations, conscientiousness may contribute to a more balanced style of sexual communication, a more fair-minded and cooperative handling of dissonant sexual preferences, and a higher commitment to promises made to the partner. Indeed, our empirical results confirm a positive role of conscientiousness in sexual communication. Conscientiousness is positively associated with expressing preferences during sex and expressing sexual needs and desires in general. Moreover, our results provide evidence that conscientiousness has a commitment value in a sexual relationship. Conscientiousness is associated with a lower likelihood of having extradyadic affairs.

Agreeableness is also associated with higher sexual satisfaction. However, our estimations provide no evidence that improved sexual communication is a transmission channel. Quite the contrary, we find some evidence of a negative role of agreeableness in sexual communication. Agreeableness is negatively associated with expressing preferences during sex. As suggested by our theoretical considerations, there can be two opposing influences. On the one hand, agreeableness may contribute to a more harmonious and empathic style of communication. On the other hand, a stronger desire for harmony and a higher degree of altruism may imply that an agreeable person to some extent sacrifices his or her personal needs. Our empirical results on sexual communication suggest that the latter influence dominates. The interesting point is that an agreeable person nonetheless experiences higher sexual satisfaction. This may be explained by a higher degree of humility implying that an agreeable person gains sexual satisfaction even if he or she sacrifices some of his or her needs. Furthermore, our estimations show that agreeableness is associated with a lower likelihood of having extradyadic affairs. This suggests that agreeableness has a commitment value.

Extraversion is associated with both higher sexual satisfaction and higher frequency of sex. Moreover, it is a positive determinant of being a good sex partner and fulfilling the partner's sexual needs and desires. Thus, extraversion appears to contribute to a mutually beneficial sex life of the person and the partner. Our results suggest that improved sexual communication is one transmission channel. Extraversion is positively associated with expressing preferences during sex and the ability of expressing sexual needs and desires in general. However, extraversion is also associated with a higher likelihood of having extradyadic affairs. Thus, while a person's extraversion contributes to a

mutually beneficial sex life of the couple, at the same time it appears to entail more severe commitment problems. The positive link between extraversion and extradyadic affairs also indicates that a more extroverted person has better outside options increasing his or her bargaining power within the sexual relationship. A stronger bargaining power enables a more extroverted person to get through his or her preferred sexual practices. Altogether, our results conform to the notion that a person's extraversion increases both the joint surplus generated by a couple's sexual relationship and the person's share in this surplus.

We also find some evidence that openness to experience is positively associated with sexual satisfaction. Furthermore, our estimations provide evidence that openness to experience is a positive determinant of being a good sex partner and fulfilling the partner's sexual needs and desires. This suggests that an open person is more able to take into account the partner's sexual preferences. Our results also show that openness to experience contributes to improved sexual communication. It is positively associated with expressing preferences during sex and the ability of expressing sexual needs and desires in general. This indicates that a person who is more open to the partner's sexual preferences has better opportunities to communicate his or her preferences to the partner. In contrast to extraversion, we find no evidence that openness to experience is associated with extradyadic affairs. Thus, our analysis provides no evidence that openness to experience has an influence on commitment problems or the person's outside options.

3.5.2 Gender Differences

While many of the results hold for both women and men, the estimations also provide evidence of some interesting gender differences in the relationship between personality and sexuality. These differences may be explained by still existing inequalities in gender roles. Gender roles are based on the different normative expectations a society has of individuals based on their sex (Blackstone 2003).^{vii} Traditional gender roles place men in a dominant and women in a subordinate position. Men are expected to be forceful and self-assertive, while women are expected to be docile, caring and generous (Eagly 1987, Ridgeway 2011, Williams and Best 1990). These normative expectations guide behavior because people experience social and personal pressure to conform to them. Violations of the normative expectations by acting in a gender atypical manner elicits backlash, or negative reactions. For example, women acting in a dominant manner tend to lose likability, while men behaving passively, unassertively or anxiously tend to lose status and respect and are more likely to be perceived as insufficiently competent (Wood and Eagly 2012).

Against this background, one can expect that gender roles to some extent moderate the relationship between personality and sexuality. Indeed, our separate estimations by gender show

that a significantly positive link between extraversion and sexual satisfaction can only be found for men, but not for women. Extraversion involves greater assertiveness and, given prevalent gender roles, assertiveness is perceived as a typical masculine attribute. Thus, a higher degree of extraversion enables men to act in a more gender typical and socially accepted way, while it leads women to act in a gender atypical and socially less accepted way. This makes it more likely that a high degree of extraversion helps men, but not women get through their preferred sexual activities in a relationship. While both extroverted men and extroverted women appear to be more able to express their sexual needs and desires, this only translates into higher sexual satisfaction for men, but not for women. A woman directly expressing her sexual needs and desires may trigger negative responses from the male partner who perceives her as being too dominant.

In contrast to extraversion, a significantly positive link between openness to experience and sexual satisfaction can only be found for women, but not for men. Unequal gender roles may also explain this result. As unequal gender roles place women in a subordinate and less powerful position, they may tend to emphasize the preferred sexual activities of their male partners.^{viii} Emphasizing the partner's preferred sexual activities is more likely to increase a woman's sexual satisfaction if she is open to experience and, hence, welcomes those activities.

Finally, our estimations suggest that personality traits play a significant role in extradyadic affairs of men, but not in extradyadic affairs of women. An explanation for this finding may be that unequal gender roles entail a sexual double standard. This sexual double standard holds that multiple sex partners are acceptable for men, but not for women (Petersen and Hyde 2011). Considering the sexual double standard, it appears to be plausible that personality traits have a stronger influence on men's than on women's inclination to have extradyadic affairs.^{ix}

3.6 Conclusions

In this study, we have developed an economics-based approach to the role personality plays in people's sex life. Personality not only shapes a person's preferences for sex. It also shapes a person's behavior in a sexual relationship. This behavior has an influence on the quality and quantity of sex and, hence, on the sexual well-being of the person and his or her partner. Personality shapes sexual communication and information sharing, the way dissonant sexual preferences of the partners are handled, and the extent to which the person is committed to promises made to the partner. Using a large representative dataset from Germany, our empirical results confirm that personality plays an important role in various dimensions of sexuality. The Big Five personality traits have an influence on

own sexual satisfaction, sexual fulfillment of the partner, sexual communication, actual and desired frequency of sex, and extradyadic affairs.

We recognize the need for future research within this theme. Economists have been increasingly interested in the determinants of life satisfaction. Against this background, a small number of econometric studies have examined the link between sex and happiness. Future research could fruitfully examine if this link depends on personality traits. Personality may not only influence the quality and quantity of sex, but may also moderate how sex translates into life satisfaction.

Furthermore, comparative analyses could be a fruitful avenue for future research. Our estimations have provided evidence of some gender differences in the relationship between personality and sex. We have argued that asymmetric gender roles may explain these differences. More generally, this indicates that the relationship between personality and sex to some extent is shaped by the social environment. This calls for comparative research systematically examining the relationship between personality and sex for different cultures, countries and societies.

Finally, on a broader scale, our study suggests that giving sex and personality a more prominent role in family economics could lead to interesting theoretical and empirical advancements in this field. For example, it would be interesting to examine the influence of sexuality on family formation and dissolution.

3.7 Appendix

Table A-1 Definitions and Descriptive Statistics of the Control Variables

<i>Variable</i>	<i>Definition</i>	<i>Mean</i>	<i>Std.dev</i>
Enrollment in education	Dummy equals 1 if the person is enrolled in education.	0.184	0.388
Full-time	Dummy equals 1 if the person is employed full-time.	0.436	0.496
Part-time	Dummy equals 1 if the person is employed part-time.	0.148	0.355
Self-employed	Dummy equals 1 if the person is self-employed.	0.058	0.234
Irregular employment	Dummy equals 1 if the person has an irregular job (e.g., internship, occasional job, mini job).	0.037	0.188
East Germany	Dummy equals 1 if the person resides in East Germany.	0.245	0.430
Female	Dummy equals 1 if the person is a woman.	0.561	0.496
Migration background	Dummy equals 1 if the person is a first- or second generation immigrant.	0.183	0.386
Number of children	Number of children living with the person in the same household.	1.057	1.115
Education	Years of schooling.	13.091	3.404
Married	Dummy equals 1 if the person is married to his or her partner.	0.531	0.499
Cohabiting	Dummy equals 1 if the person is not married to the partner and the couple lives together in the same dwelling.	0.236	0.425
Health	Ordered variable for the person's health status during the past four weeks. The variable ranges from 1 "bad" to 5 "very good".	3.733	0.950
Relationship duration	Duration of the relationship with the current partner in months.	109.213	87.311
Age	The person's age in years.	32.871	7.794
Age squared	The person's age squared.	1141.257	502.392
Protestant	Dummy equals 1 if the person has a Protestant religious affiliation.	0.321	0.467
Catholic	Dummy equals 1 if the person has a Catholic religious affiliation.	0.288	0.453
Muslim	Dummy equals 1 if the person has a Muslim religious affiliation.	0.028	0.166
Other religion	Dummy equals 1 if the person has another religious affiliation.	0.031	0.172
Cohort dummies	Dummy variables for the birth cohort.	-----	-----
Wave dummies	Dummy variables for the years of observation.	-----	-----

N = 35204. The reference group of the variables for marriage and cohabitation (variables for employment status, variables for religion) consists of persons who do not live together with the partner (persons who are unemployed or out of the labor force, persons who are not religious).

Table A-2 Determinants of Sexual Satisfaction; Full Results

<i>Explanatory Variables</i>	(1) All	(2) Only Men	(3) Only Women
Extraversion	0.080 (2.807)***	0.146 (3.413)***	0.022 (0.571)
Openness	0.049 (1.594)	0.006 (0.135)	0.091 (2.183)**
Conscientiousness	0.293 (8.609)***	0.338 (6.759)***	0.266 (5.720)***
Agreeableness	0.190 (6.669)***	0.232 (5.323)***	0.156 (4.179)***
Neuroticism	-0.255 (9.001)***	-0.179 (3.911)***	-0.304 (8.446)***
Enrollment in education	0.009 (0.140)	-0.124 (1.057)	0.094 (1.227)
Full-time	0.063 (1.241)	-0.027 (0.264)	0.135 (2.118)**
Part-time	0.132 (2.491)**	0.049 (0.285)	0.126 (2.243)**
Self-employed	0.074 (0.870)	-0.071 (0.487)	0.171 (1.540)
Irregular employment	0.044 (0.544)	-0.150 (0.654)	0.060 (0.703)
East Germany	0.183 (3.041)***	0.204 (2.305)**	0.164 (1.994)*
Female	0.238 (4.545)***	-----	-----
Migration background	0.310 (4.262)***	0.532 (4.734)***	0.157 (1.659)*
Number of children	-0.057 (2.068)**	-0.076 (1.838)*	-0.025 (0.656)
Education	-0.031 (4.884)***	-0.032 (3.204)***	-0.029 (3.476)***
Married	-0.594 (8.709)***	-0.528 (5.273)***	-0.600 (6.379)***
Cohabiting	-0.625 (12.180)***	-0.541 (6.984)***	-0.672 (9.769)***
Health	0.161 (11.276)***	0.169 (7.323)***	0.154 (8.509)***
Relationship duration	-0.006 (12.623)***	-0.007 (9.003)***	-0.006 (9.147)***
Age	-0.099 (2.679)***	-0.133 (2.320)**	-0.092 (1.887)*
Age squared	0.002 (4.469)***	0.003 (4.195)***	0.001 (2.645)***
Protestant	0.019 (0.338)	-0.047 (0.558)	0.073 (0.940)
Catholic	0.018 (0.281)	-0.043 (0.459)	0.063 (0.757)
Muslim	0.692 (4.022)***	0.430 (1.814)*	0.881 (3.472)***
Other religion	0.341 (2.711)***	0.330 (1.593)	0.355 (2.318)**

Constant	3.035 (31.069)***	2.898 (20.681)***	3.125 (23.158)***
Wave dummies	Included	Included	Included
Cohort dummies	Included	Included	Included
Log likelihood	-70357.120	-30809.010	-39489.040
Number of persons	7263	3288	3975
Number of observations	35204	15472	19732

Method: Random effects ordered logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. *** Statistically significant at the 1% level; ** 5% level; * 10% level.

Table A-3 Determinants of Being a Good Sex Partner; Full Results

<i>Explanatory Variables</i>	(1) <i>All</i>	(2) <i>Only Men</i>	(3) <i>Only Women</i>
Extraversion	0.318 (6.969)***	0.383 (5.708)***	0.265 (4.278)***
Openness	0.270 (5.437)***	0.353 (4.853)***	0.219 (3.233)***
Conscientiousness	0.367 (6.408)***	0.474 (5.655)***	0.307 (3.887)***
Agreeableness	0.058 (1.239)	0.054 (0.801)	0.071 (1.104)
Neuroticism	-0.333 (7.526)***	-0.262 (3.966)***	-0.366 (6.189)***
Enrollment in education	-0.093 (0.842)	-0.348 (1.752)*	0.014 (0.104)
Full-time	-0.079 (0.858)	-0.253 (1.382)	-0.057 (0.505)
Part-time	0.004 (0.034)	0.021 (0.066)	-0.007 (0.058)
Self-employed	-0.115 (0.798)	-0.407 (1.569)	0.081 (0.471)
Irregular employment	0.0101 (0.067)	-0.273 (0.753)	0.058 (0.352)
East Germany	0.122 (1.434)	-0.165 (1.315)	0.330 (2.870)***
Female	-0.611 (8.197)***	-----	-----
Migration background	0.388 (3.816)***	0.419 (2.648)***	0.335 (2.555)**
Number of children	0.055 (1.308)	0.165 (2.666)***	-0.034 (0.577)
Education	-0.012 (1.193)	-0.010 (0.662)	-0.013 (1.023)
Married	-0.683 (6.172)***	-0.768 (4.674)***	-0.566 (3.700)***
Cohabiting	-0.595 (7.307)***	-0.428 (3.477)***	-0.683 (6.296)***
Health	0.104 (3.666)***	0.201 (4.578)***	0.050 (1.340)
Relationship duration	-0.006 (8.472)***	-0.004 (3.549)***	-0.007 (8.213)***
Age	-0.199 (2.909)***	-0.273 (2.655)***	-0.141 (1.543)
Age squared	0.002 (2.207)**	0.002 (1.764)*	0.002 (1.394)
Protestant	0.027 (0.331)	0.139 (1.144)	-0.048 (0.420)
Catholic	-0.015 (0.166)	0.160 (1.161)	-0.114 (0.907)
Muslim	0.100 (3.778)***	0.830 (2.411)**	1.260 (2.975)***
Other religion	0.375 (1.954)*	0.436 (1.481)	0.352 (1.379)

Constant	4.136 (19.880)***	3.848 (12.521)***	4.284 (15.364)***
Wave dummies	Included	Included	Included
Cohort dummies	Included	Included	Included
Log likelihood	-14476.050	-5952.455	-8440.108
Number of persons	5652	2558	3094
Number of observations	12948	5723	7225

Method: Random effects ordered logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. *** Statistically significant at the 1% level; ** 5% level; * 10% level.

Table A-4 Determinants of Fulfilling Partner's Sexual Needs and Desires; Full Results

<i>Explanatory Variables</i>	(1) <i>All</i>	(2) <i>Only Men</i>	(3) <i>Only Women</i>
Extraversion	0.349 (8.379)***	0.440 (7.108)***	0.273 (4.842)***
Openness	0.305 (6.709)***	0.290 (4.305)***	0.324 (5.269)***
Conscientiousness	0.429 (8.227)***	0.511 (6.729)***	0.383 (5.325)***
Agreeableness	0.048 (1.141)	0.096 (1.543)	0.025 (0.433)
Neuroticism	-0.226 (5.567)***	-0.147 (2.381)**	-0.264 (4.944)***
Enrollment in education	-0.100 (0.963)	-0.106 (0.553)	-0.063 (0.485)
Full-time	-0.225 (2.576)***	-0.237 (1.352)	-0.203 (1.928)*
Part-time	-0.111 (1.100)	0.135 (0.429)	-0.146 (1.393)
Self-employed	-0.185 (1.334)	-0.193 (0.798)	-0.156 (0.876)
Irregular employment	-0.054 (0.346)	0.025 (0.070)	-0.078 (0.466)
East Germany	0.092 (1.179)	-0.061 (0.516)	0.204 (1.953)*
Female	-0.316 (4.547)***	-----	-----
Migration background	0.168 (1.799)*	0.180 (1.243)	0.137 (1.131)
Number of children	0.063 (1.680)*	0.162 (2.916)***	-0.017 (0.322)
Education	-0.019 (2.131)**	-0.012 (0.886)	-0.027 (2.242)**
Married	-0.489 (4.899)***	-0.534 (3.565)***	-0.441 (3.201)***
Cohabiting	-0.437 (5.737)***	-0.399 (3.465)***	-0.445 (4.322)***
Health	0.110 (4.158)***	0.157 (3.810)***	0.082 (2.404)**
Relationship duration	-0.005 (7.963)***	-0.004 (4.456)***	-0.005 (6.695)***
Age	-0.207 (3.202)***	-0.245 (2.478)**	-0.170 (1.966)**
Age squared	0.002 (3.000)***	0.004 (2.833)***	0.002 (1.436)
Protestant	0.014 (0.177)	0.044 (0.374)	0.001 (0.014)
Catholic	-0.067 (0.795)	0.001 (0.008)	-0.103 (0.896)
Muslim	0.613 (2.633)***	0.500 (1.631)	0.722 (1.940)*
Other religion	0.240 (1.324)	0.122 (0.460)	0.333 (1.356)

Constant	3.227 (19.774)***	3.194 (12.669)***	3.209 (15.086)***
Wave dummies	Included	Included	Included
Cohort dummies	Included	Included	Included
Log likelihood	-14731.680	-6166.200	-8512.297
Number of persons	5725	2598	3127
Number of observations	13182	5844	7338

Method: Random effects ordered logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. *** Statistically significant at the 1% level; ** 5% level; * 10% level.

Table A-5 Determinants of Expressing Preferences during Sex; Full Results

<i>Explanatory Variables</i>	(1) <i>All</i>	(2) <i>Only Men</i>	(3) <i>Only Women</i>
Extraversion	0.410 (9.704)***	0.398 (6.343)***	0.400 (6.994)***
Openness	0.296 (6.312)***	0.216 (3.137)***	0.359 (5.593)***
Conscientiousness	0.298 (5.771)***	0.241 (3.368)***	0.370 (4.983)***
Agreeableness	-0.079 (1.809)*	-0.021 (0.329)	-0.135 (2.225)**
Neuroticism	-0.229 (5.489)***	-0.225 (3.567)***	-0.221 (3.966)***
Enrollment in education	-0.117 (1.224)	-0.556 (3.276)***	0.164 (1.370)
Full-time	-0.206 (2.480)**	-0.482 (3.136)***	-0.025 (0.236)
Part-time	-0.190 (1.947)*	-0.509 (1.815)*	-0.138 (1.318)
Self-employed	-0.254 (1.874)*	-0.565 (2.659)***	-0.049 (0.251)
Irregular employment	0.069 (0.485)	-0.150 (0.437)	0.084 (0.549)
East Germany	0.121 (1.509)	0.088 (0.756)	0.152 (1.364)
Female	0.066 (0.937)	-----	-----
Migration background	0.199 (2.105)**	0.344 (2.416)**	0.083 (0.664)
Number of children	0.039 (1.013)	0.047 (0.823)	0.065 (1.211)
Education	-0.019 (2.054)**	-0.023 (1.644)	-0.016 (1.376)
Married	-0.291 (2.933)***	-0.499 (3.257)***	-0.076 (0.570)
Cohabiting	-0.244 (3.323)***	-0.297 (2.723)***	-0.166 (1.650)*
Health	0.076 (2.983)**	0.169 (4.323)**	0.013 (0.376)
Relationship duration	-0.003 (6.074)***	-0.004 (4.710)***	-0.004 (4.502)***
Age	0.007 (0.112)	-0.116 (1.242)	0.096 (1.104)
Age squared	-0.001 (0.911)	0.001 (0.642)	-0.002 (1.555)
Protestant	-0.043 (0.537)	-0.021 (0.176)	-0.048 (0.442)
Catholic	-0.164 (1.906)*	-0.148 (1.143)	-0.165 (1.423)
Muslim	-0.143 (0.575)	-0.307 (0.925)	-0.035 (0.092)
Other religion	-0.173 (0.941)	-0.358 (1.456)	-0.028 (0.107)

Constant	3.526 (21.096)***	3.339 (13.732)***	3.656 (15.965)***
Wave dummies	Included	Included	Included
Cohort dummies	Included	Included	Included
Log likelihood	-16375.930	-7082.487	-9241.700
Number of persons	5786	2624	3162
Number of observations	13507	5974	7533

Method: Random effects ordered logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. *** Statistically significant at the 1% level; ** 5% level; * 10% level.

Table A-6 Determinants of Expressing Sexual Needs and Desires in General; Full Results

<i>Explanatory Variables</i>	(1) All	(2) Only Men	(3) Only Women
Extraversion	0.424 (9.696)***	0.497 (7.581)***	0.356 (6.086)***
Openness	0.316 (6.593)***	0.273 (3.883)***	0.354 (5.430)***
Conscientiousness	0.401 (7.567)***	0.409 (5.352)***	0.421 (5.714)***
Agreeableness	-0.034 (0.773)	-0.014 (0.219)	-0.051 (0.857)
Neuroticism	-0.273 (6.279)***	-0.257 (3.926)***	-0.270 (4.651)***
Enrollment in education	-0.144 (1.462)	-0.470 (2.569)**	0.065 (0.535)
Full-time	-0.213 (2.504)**	-0.427 (2.542)**	-0.077 (0.728)
Part-time	-0.023 (0.234)	-0.068 (0.233)	-0.006 (0.059)
Self-employed	-0.206 (1.477)	-0.453 (1.932)*	-0.030 (0.156)
Irregular employment	0.176 (1.209)	-0.081 (0.260)	0.223 (1.393)
East Germany	0.101 (1.266)	-0.018 (0.155)	0.198 (1.813)*
Female	-0.185 (2.555)**	-----	-----
Migration background	0.219 (2.277)**	0.485 (3.375)***	0.028 (0.222)
Number of children	0.076 (1.954)*	0.093 (1.613)	0.086 (1.610)
Education	-0.046 (5.055)***	-0.058 (4.108)***	-0.040 (3.308)***
Married	-0.515 (5.151)***	-0.700 (4.684)***	-0.331 (2.397)**
Cohabiting	-0.354 (4.651)***	-0.531 (4.636)***	-0.189 (1.834)*
Health	0.114 (4.257)***	0.188 (4.524)***	0.068 (1.961)**
Relationship duration	-0.004 (6.615)***	-0.003 (4.042)***	-0.005 (5.631)***
Age	-0.040 (0.619)	0.008 (0.085)	-0.077 (0.878)
Age squared	0.000 (0.321)	0.001 (0.586)	0.000 (0.028)
Protestant	-0.071 (0.913)	-0.036 (0.316)	-0.087 (0.823)
Catholic	-0.179 (2.073)**	-0.148 (1.167)	-0.184 (1.561)
Muslim	0.515 (2.179)**	0.239 (0.747)	0.658 (1.805)*
Other religion	0.111 (0.534)	-0.007 (0.027)	0.225 (0.722)

Constant	3.737 (20.766)***	3.429 (13.761)***	3.927 (15.668)***
Wave dummies	Included	Included	Included
Cohort dummies	Included	Included	Included
Log likelihood	-15715.300	-6631.123	-9019.434
Number of persons	5776	2619	3157
Number of observations	13449	5958	7491

Method: Random effects ordered logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. *** Statistically significant at the 1% level; ** 5% level; * 10% level.

Table A-7 Determinants of Frequency of Intercourse; Full Results

<i>Explanatory Variables</i>	(1) All	(2) Only Men	(3) Only Women
Extraversion	0.337 (5.014)***	0.468 (4.682)***	0.218 (2.416)**
Openness	0.033 (0.431)	0.018 (0.154)	0.059 (0.598)
Conscientiousness	0.093 (1.079)	0.275 (2.129)**	-0.032 (0.272)
Agreeableness	-0.021 (0.296)	-0.129 (1.149)	0.052 (0.577)
Neuroticism	-0.224 (3.395)***	-0.149 (1.405)	-0.264 (3.155)***
Enrollment in education	0.306 (1.690)*	-0.128 (0.340)	0.615 (2.889)***
Full-time	0.347 (2.553)**	0.153 (0.505)	0.591 (3.669)***
Part-time	0.565 (4.578)***	0.865 (1.936)*	0.500 (3.927)***
Self-employed	0.216 (1.071)	-0.022 (0.055)	0.384 (1.666)*
Irregular employment	0.357 (1.784)*	-0.283 (0.407)	0.421 (2.134)**
East Germany	0.490 (3.141)***	0.168 (0.711)	0.748 (3.582)***
Female	-0.285 (2.186)**	-----	-----
Migration background	0.797 (4.539)***	0.919 (3.347)***	0.690 (3.018)***
Number of children	-0.089 (1.354)	-0.128 (1.228)	-0.001 (0.013)
Education	-0.009 (0.467)	0.036 (1.148)	-0.042 (1.755)*
Married	-1.738 (8.699)***	-1.574 (5.190)***	-1.761 (6.642)***
Cohabiting	-1.410 (8.896)***	-1.429 (5.929)***	-1.348 (6.435)***
Health	0.129 (3.519)***	0.144 (2.354)**	0.111 (2.440)**
Relationship duration	-0.020 (16.787)***	-0.025 (12.146)***	-0.017 (12.207)***
Age	-0.283 (2.875)***	-0.438 (2.745)***	-0.218 (1.761)*
Age squared	0.005 (4.608)***	0.008 (4.653)***	0.003 (2.258)**
Protestant	-0.068 (0.478)	-0.165 (0.762)	0.050 (0.269)
Catholic	-0.160 (0.999)	-0.540 (2.276)**	0.136 (0.631)
Muslim	0.306 (0.683)	0.900 (1.450)	-0.382 (0.584)
Other religion	0.141 (0.403)	-0.728 (1.374)	0.869 (1.950)*

Constant	12.417 (7.438)***	14.034 (5.140)***	11.642 (5.580)***
Wave dummies	Included	Included	Included
Cohort dummies	Included	Included	Included
R ²	0.142	0.167	0.119
Number of persons	6947	3151	3796
Number of observations	30517	13477	17040

Method: Random effects GLS. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. *** Statistically significant at the 1% level; ** 5% level; * 10% level.

Table A-8 Determinants of Desire for Less Frequent or More Frequent Sex; Full Results

<i>Explanatory Variables</i>	(1) <i>All</i>		(2) <i>Only Men</i>		(3) <i>Only Women</i>	
	<i>Less Sex</i>	<i>More Sex</i>	<i>Less Sex</i>	<i>More Sex</i>	<i>Less Sex</i>	<i>More Sex</i>
Extraversion	-0.110 (1.331)	0.094 (2.600)***	-0.159 (1.048)	0.081 (1.449)	-0.097 (1.035)	0.124 (2.568)**
Openness	-0.148 (1.697)*	0.029 (0.728)	0.045 (0.230)	-0.053 (0.833)	-0.163 (1.688)*	0.088* (1.684)
Conscientiousness	-0.130 (1.273)	-0.122 (2.597)***	-0.005 (0.019)	-0.137 (1.955)*	-0.149 (1.321)	-0.118 (1.846)*
Agreeableness	-0.088 (1.075)	-0.059 (1.582)	-0.186 (0.887)	-0.069 (1.147)	-0.073 (0.811)	-0.037 (0.772)
Neuroticism	0.215 (2.748)***	0.175 (4.689)***	0.323 (2.049)**	0.180 (3.038)***	0.194 (2.209)**	0.177 (3.652)***
Enrollment in education	0.213 (0.988)	0.112 (1.067)	-0.969 (1.629)	0.419 (2.088)**	0.310 (1.403)	0.174 (1.376)
Full-time	-0.090 (0.527)	-0.005 (0.060)	-0.447 (1.029)	0.142 (0.837)	-0.130 (0.709)	-0.232 (2.182)**
Part-time	-0.009 (0.053)	-0.150 (1.579)	0.082 (0.105)	0.426 (1.402)	-0.032 (0.189)	-0.180 (1.765)*
Self-employed	-0.638 (2.100)**	0.124 (0.954)	-1.012 (1.483)	0.396 (1.793)*	-0.711 (2.035)**	-0.059 (0.339)
Irregular employment	0.471 (1.955)*	0.096 (0.615)	0.164 (0.142)	0.676 (1.522)	0.464 (1.861)*	0.079 (0.483)
East Germany	0.016 (0.111)	-0.112 (1.680)*	-0.875 (2.502)**	-0.164 (1.593)	0.164 (1.018)	-0.076 (0.862)
Female	1.094 (6.807)***	-0.769 (12.336)***	-----	-----	-----	-----
Migration background	0.233 (1.552)	-0.085 (1.056)	0.471 (1.394)	-0.171 (1.291)	0.189 (1.138)	-0.044 (0.424)
Number of children	0.149 (2.538)**	-0.029 (0.890)	-0.005 (0.034)	0.014 (0.250)	0.158 (2.543)**	-0.131 (2.987)***
Education	0.046 (2.231)**	0.059 (5.929)***	-0.025 (0.474)	0.081 (5.030)***	0.051 (2.253)**	0.041 (3.148)***
Married	0.319 (1.525)	0.533 (5.509)***	1.026 (2.236)**	0.724 (4.744)***	0.196 (0.835)	0.322 (2.568)**
Cohabiting	0.419 (2.450)**	0.392 (5.350)***	0.650 (1.855)*	0.511 (4.680)***	0.376 (1.902)*	0.270 (2.827)***
Health	-0.097 (1.760)*	-0.096 (3.847)***	-0.114 (0.904)	-0.073 (1.793)*	-0.094 (1.551)	-0.101 (3.204)***
Relationship duration	0.001 (0.844)	0.001 (2.038)**	-0.004 (1.629)	0.004 (4.793)***	0.001 (0.685)	-0.0004 (0.689)
Age	-0.272 (1.767)*	0.056 (0.808)	-0.541 (1.390)	0.030 (0.283)	-0.205 (1.212)	0.107 (1.170)
Age squared	0.003 (1.335)	-0.001 (0.903)	0.008 (1.409)	-0.001 (0.443)	0.002 (0.731)	-0.002 (1.270)
Protestant	0.046 (0.314)	-0.073 (1.094)	-0.172 (0.492)	-0.058 (0.562)	0.076 (0.475)	-0.105 (1.179)
Catholic	0.118 (0.740)	-0.011 (0.144)	0.052 (0.156)	0.074 (0.644)	0.126 (0.703)	-0.073 (0.725)
Muslim	0.363 (1.121)	-0.503 (2.651)***	0.038 (0.062)	-0.459 (1.758)*	0.315 (0.842)	-0.581 (1.899)*
Other religion	0.139	-0.259	-0.863	-0.352	0.317	-0.207

	(0.445)	(1.536)	(0.860)	(1.396)	(0.945)	(0.941)
Constant	1.988 (0.740)	-1.141 (0.948)	6.873 (1.062)	-1.158 (0.628)	2.023 (0.685)	-2.377 (1.501)
Wave dummies	Included	Included	Included	Included	Included	Included
Cohort dummies	Included	Included	Included	Included	Included	Included
Log likelihood	-10297.920		-3783.327		-6380.738	
Number of persons	12911		5745		7166	
Number of observations	4411		1971		2440	

Method: Multinomial logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. *** Statistically significant at the 1% level; ** 5% level; * 10% level.

Table A-9 Determinants of Extradyadic Affairs; Full Results

<i>Explanatory Variables</i>	(1) <i>All</i>	(2) <i>Only Men</i>	(3) <i>Only Women</i>
Extraversion	0.508 (2.877)***	0.624 (2.729)***	0.332 (1.538)
Openness	-0.041 (0.213)	0.173 (0.743)	-0.158 (0.617)
Conscientiousness	-0.533 (2.518)**	-0.609 (2.382)**	-0.404 (1.419)
Agreeableness	-0.445 (2.444)**	-0.561 (2.454)**	-0.316 (1.369)
Neuroticism	0.417 (2.290)**	0.481 (2.104)**	0.353 (1.532)
Enrollment in education	0.173 (0.383)	0.759 (0.942)	0.141 (0.246)
Full-time	0.176 (0.474)	0.967 (1.261)	-0.063 (0.141)
Part-time	-0.373 (0.897)	1.388 (1.599)	-0.756 (1.697)*
Self-employed	0.689 (1.188)	1.654 (1.870)*	0.315 (0.404)
Irregular employment	-0.865 (1.530)	-0.669 (0.387)	-0.910 (1.624)
East Germany	-0.109 (0.324)	-1.060 (2.229)**	0.701 (1.725)*
Female	-0.429 (1.458)	-----	-----
Migration background	-0.003 (0.008)	0.211 (0.491)	-0.433 (0.967)
Number of children	-0.043 (0.278)	-0.017 (0.096)	-0.070 (0.324)
Education	-0.004 (0.103)	-0.055 (1.311)	0.053 (1.156)
Married	0.525 (1.226)	1.332 (2.454)**	-0.195 (0.351)
Cohabiting	0.065 (0.190)	0.821 (1.691)*	-0.573 (1.349)
Health	-0.020 (0.190)	-0.034 (0.260)	-0.000 (0.003)
Relationship duration	-0.004 (1.723)*	-0.007 (1.883)*	-0.003 (0.879)
Age	-0.433 (1.625)	-0.409 (1.325)	-0.493 (1.330)
Age squared	0.005 (1.745)*	0.003 (0.772)	0.008 (1.930)*
Protestant	0.108 (0.333)	-0.196 (0.498)	0.555 (1.343)
Catholic	-0.041 (0.117)	-0.233 (0.553)	0.391 (0.882)
Muslim	-1.081 (1.207)	-0.844 (0.914)	-----
Other religion	-0.874 (1.222)	-0.889 (0.916)	-0.588 (0.685)

Constant	0.485 (0.110)	0.663 (0.129)	0.228 (0.037)
Wave dummies	Included	Included	Included
Cohort dummies	Included	Included	Included
Pseudo R ²	0.07	0.01	0.12
Number of persons	4927	2123	2804
Number of observations	11223	4734	6489

Method: Random effects logit. The table shows the estimated coefficients. Z-statistics in parentheses are based on standard errors clustered at the person level. *** Statistically significant at the 1% level; ** 5% level; * 10% level. In estimation (3), the variable for Muslims is not included because of perfect overlap with the dependent variable.

3.8 Endnotes

ⁱ Peterson et al. (2011) provide evidence that preferences for sex acts depend on personality traits.

ⁱⁱ While humility is a component of agreeableness in the Big Five model, it belongs to an additional dimension of personality (the honesty-humility dimension) in the alternative HEXACO model (Ashton et al. 2014).

ⁱⁱⁱ Castelo-Branco et al. (2010) provide evidence of a substantial over-reporting of sexual activity and importance of sex in personal interviews as compared to anonymous questionnaires.

^{iv} The waves 2008 and 2009 also contain information on extradyadic affairs. We do not consider these waves as the information on extradyadic affairs has a different time frame.

^v Control variables are included in the regressions, but are suppressed to save space. The full results can be found in the Appendix.

^{vi} We prefer the random effects model over a fixed effects approach. The fixed effects approach only takes into account within variation of the variables, but throws away all the information contained in the cross-sectional variation in the data. Thus, time-invariant variables cannot be included in a fixed effects regression. While variables with small variation across time may be included, small within variation can result in highly inefficient estimates. Moreover, attenuation bias due to measurement errors is likely to be more severe in fixed effects regressions (Swaffield 2001).

^{vii} While the concept of gender roles traditionally plays a key role in sociology, economists increasingly recognize that gender roles are crucial for understanding socio-economic outcomes (Akerlof and Kranton 2000, 2005, Albanesi and Olivetti 2016, Alesina et al. 2013, Bertrand et al. 2015).

^{viii} As shown by regression (1) in Table A-2, women nonetheless express higher sexual satisfaction than men. This may be explained by lower expectations women have. A related result and explanation can also be found in the literature on gender and job satisfaction (Clark 1997).

^{ix} The sexual double standard may not only imply an indirect moderating, but also a direct role of gender in extradyadic affairs. I.e., women should have a lower probability of having extradyadic affairs than men. As shown by regression (1) in Table A-9, the variable for women indeed takes a negative coefficient. While the coefficient is not statistically significant, a t-statistic of about 1.5 suggests that the variable contributes to explaining extradyadic affairs.

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Deutsche Zusammenfassung der Dissertation “Econometric Essays on Population Economics: Retirement, Fertility, Sexuality”

Diese Dissertation umfasst drei Beiträge aus dem Bereich der Bevölkerungsökonomie und deckt mit den Kapiteln Ruhestand, Fertilität und Sexualität eine große thematische Bandbreite ab. Das erste Kapitel befasst sich mit dem Wohlbefinden am Arbeitsplatz in einer alternden Bevölkerung. Mit zunehmendem Alter beschäftigen sich Menschen vermehrt mit ihrem Renteneintritt. Der Gesundheitszustand stellt natürlicherweise eine Einschränkung für das Arbeitsangebot dar. Darüber hinaus prägen jedoch auch Konflikte mit dem Vorgesetzten das Wohlbefinden am Arbeitsplatz und den Wunsch mancher, den Beruf aufzugeben. Gegenstand des zweiten Kapitels ist der Übergang junger Frauen von der Adoleszenz ins Erwachsenenalter. Kindheit und Adoleszenz sind stark vom Erziehungsstil der Eltern geprägt. Durch die Interaktion zwischen Eltern und Kindern können sich Werte und Normen, wie z.B. religiöse Normen, auf das Sexual-, Verhütungs- und Fertilitätsverhalten junger Frauen übertragen. Das dritte Kapitel sieht Sexualität als wichtiges Partnerschaftsthema an und befasst sich mit der Bedeutung von Persönlichkeit, Geschlechterunterschieden und Kommunikation.

Jedes Kapitel dieser Dissertation ist von ökonomischer Relevanz. Zwischenmenschliche Konflikte am Arbeitsplatz wirken sich auf eine Vielzahl von Ergebnissen aus, wie z.B. Leistung, Output (z.B. von Barki/Hartwick 2004) sowie Gesundheit (z.B. Romanov et al. 1996), Burn-out, Fluktuation (z.B. Jaramillo et al. 2011, De Dreu/Weingart 2003) oder Renteneintrittsentscheidungen. Da der Eintritt in den Ruhestand das Arbeitskräfteangebot an erfahrenen Arbeitnehmern auf Null senkt, ist dieses Thema sowohl für Arbeitgeber als auch für politische Entscheidungsträger, die für die Gestaltung des Rentensystems verantwortlich sind, besonders relevant. Die Geburt eines Kindes hat für junge Frauen umfassende ökonomische Konsequenzen. Direkte monetäre Einkommensverluste entstehen während der Elternzeit, während unbezahlten Erziehungsurlaubs und während anschließender Teilzeitarbeit (z.B. Blau/Kahn 2017, Jacobson et al. 1999, Kravdal 1992, Joshi 1990). Aufgrund des geringeren Beschäftigungsniveaus bleibt die Berufserfahrung geringer, Weiterbildungen werden seltener besucht und Karrierechancen gehen verloren, was zusammengenommen zu indirekten Einkommensverlusten führt (z.B. Blau/Kahn 2017, Barron et al. 1993, Altonji/Spletzer 1991, Mincer/Polachek 1974). Die ökonomische Relevanz von Sexualität wird durch folgende Aspekte deutlich: Sexualität hat entscheidenden Einfluss auf die Qualität von Partnerschaften, das subjektive Wohlbefinden und Glück (z.B. Schmiedeberg et al. 2017, Wadsworth 2014, Elmslie/Tebaldi 2014,

Blanchflower/Oswald 2004). Wohlbefinden und Glück wiederum sind nicht nur im Privatleben wichtige Schlüsseldeterminanten, sondern auch im Arbeitsbereich, z.B. der Arbeitsleistung (Oswald et al. 2015). Darüber hinaus hat die Qualität der Partnerschaft unmittelbaren Einfluss auf die Dauer und auf das Fortbestehen einer Partnerschaft, was wiederum von ökonomischer Relevanz ist, weil in Partnerschaften und Ehen (finanzielle) Ressourcen gepoolt werden können.

Die drei Kapitel dieser Dissertation haben ihren Ansatzpunkt in der ökonomischen Standardtheorie, die Entscheidungsfindung unter einer Kosten-Nutzen-Analyse unterstellt. Wirtschaftssubjekte - Angestellte, Frauen, Partner - interagieren, um ein Gleichgewicht zwischen Kosten und Nutzen zu erreichen, bei dem der eigene Nutzen - aus Pensionierung, Fertilitäts- oder Sexualverhalten - maximiert wird. Die ökonomische Theorie kann auf allgemeinere Zusammenhänge angewendet werden. Das Eindringen ökonomischer Modelle in neue Disziplinen wie Fertilität oder Sexualverhalten ist ein neu entstehender Forschungsstrang (z.B. Lazear 2000, Borghans et al. 2008). Die Kapitel der vorliegenden Dissertation berücksichtigen, dass die Entscheidungsfindung in einem sozialen Kontext stattfindet. Konzepte aus Soziologie und Psychologie werden auf ökonomische Modelle angewandt (z.B. Lazear 2000, Lundberg 2011, Gabaix 2014, Thaler 2017) und helfen, menschliches Verhalten dort zu erklären, wo ökonomische Standardmodelle an ihre Grenzen stoßen. Es ist denkbar, dass Nutzenfunktionen nicht-monetäre Präferenzen widerspiegeln. Huettel und Kranton (2012) zum Beispiel führen diese Präferenzen auf die Identitäten und sozialen Verhaltensnormen der Menschen in verschiedenen sozialen Kontexten zurück. Darüber hinaus liefert Khalil (2017) Ideen dazu, wie soziale Normen entstehen und ob die Gesellschaft soziale Normen bestimmt, an die sich Individuen nach einem rationalen Wahlprozess halten, oder ob soziale Normen als Ergebnis einer rationalen Wahl entstehen. Chong (1996) analysiert die Wechselwirkung von (sozialen) Werten und (wirtschaftlichen) Interessen und wie diese dazu beitragen, menschliches Verhalten vorherzusagen. Mit Hilfe großer und repräsentativer Datensätze ist es in den letzten Jahren möglich geworden, Verhaltensanomalien aus ökonomischen Standardprognosen aufzudecken (Chetty 2015). Verschiedene Autoren weisen auf den Zusammenhang zwischen kognitiven Fähigkeiten und Verhaltensverzerrungen hin (z.B. Benjamin et al. 2013, Becker et al. 2012, Jagelka 2020). Neben Kognition scheinen jedoch auch Persönlichkeitsmerkmale wichtige Determinanten für menschliches Verhalten zu sein, die letztlich die konventionellen ökonomischen Präferenzparameter prägen (Borghans et al. 2008). Persönlichkeitsmerkmale können weiterhin dazu beitragen, demographische Ereignisse wie Sexual- und Eheverhalten oder Fruchtbarkeit zu erklären (Lundberg 2011). Forschung kann von einem multidisziplinären Ansatz profitieren. Dies wird ein entscheidender Aspekt in den drei Kapiteln dieser Dissertation sein.

Das erste Kapitel dieser Dissertation über Konflikte mit dem Vorgesetzten und Renteneintrittspläne fußt auf der Idee, dass diese Entscheidungen mehr sind als ein reines wirtschaftliches Abwägen. Unbestritten ist die Renteneintrittswahrscheinlichkeit an die wirtschaftlichen Verhältnisse und den Gesundheitszustand eines Arbeitnehmenden gebunden. Die Entscheidungsfindung ist jedoch in einen sozialen Kontext eingebunden. Konflikte mit dem Vorgesetzten können für die Entscheidung über den Renteneintritt relevant sein. Ein zwischenmenschlicher Konflikt kann als eine Kombination aus Meinungsverschiedenheiten, negativen Emotionen und Widerstreit verstanden werden (Barki/Hartwick 2004). Es handelt sich um einen dynamischen Prozess zwischen voneinander abhängigen Parteien, wie z.B. Arbeitgeber und Arbeitnehmer. Der Konflikt kann aus Meinungsverschiedenheiten über die Aufgabe, persönliche Werten, Ansichten oder Präferenzen des anderen entstehen. Diese Uneinigkeit ist mit negativen Emotionen wie Ärger und Frustration verbunden. Eine mögliche Lösung dieses Konflikts ist das Beenden des Arbeitsverhältnisses durch den vorgezogenen Renteneintritt. Das zweite Kapitel über Religion und Fertilität konzentriert sich auf die Bedeutung sozialer Normen. Eine interessante Metaanalyse von Steel et al. (2018) zum subjektiven Wohlbefinden ergab, dass Kultur (d.h. gemeinsame und relativ stabile Werte) tatsächlich eine Rolle spielt. Soziale Werte, wie z.B. Freiheit, Nächstenliebe, Schutz des Lebens oder Hilfsbereitschaft, sind eine Reihe von moralischen Prinzipien, die eine Legitimationsgrundlage für menschliches Verhalten bilden. Werden sie auf eine bestimmte Situation, z.B. Schwangerschaft, angewandt, können sich die Werte in soziale Normen verwandeln, die der Feinabstimmung des sozialen Verhaltens dienen. Ungehorsam impliziert Sanktionen (Hillmann 2017, Wiswede 2017). Normen manifestieren sich in verschiedenen Lebensbereichen wie persönliche Beziehungen, Familien, Kirchen und Schulen. Einige werden sogar durch gesetzliche Autorität, z.B. Abtreibungsgesetze, gestützt (Chong 1996). Das zweite Kapitel zeigt, dass Religion als soziale Norm die Entscheidungsfindung im Fertilitätsverhalten stark beeinflussen kann. Aus einer rationalen Entscheidungsperspektive geht Chong (1996) davon aus, dass Menschen ihre Werte ändern, wenn es nicht mehr vorteilhaft ist, sich ihnen weiterhin anzupassen, beispielsweise wenn sich die sozialen Bedingungen ändern. Es kann davon ausgegangen werden, dass die Veränderung von Werten und Normen stark genug ist, um sich in einem veränderten Fertilitätsverhalten niederzuschlagen. Normgesteuertes Verhalten wiederum unterscheidet sich von Verhalten, das durch die Persönlichkeit geprägt ist. Das dritte Kapitel dieser Dissertation beleuchtet, wie stark sich Persönlichkeit in einem wichtigen Bereich der Partnerschaft auswirkt: der Sexualität. Zu Beginn der Forschungsarbeiten zum dritten Kapitel dieser Dissertation lag der Schwerpunkt auf dem Einfluss von Erwerbstätigkeit, Religion sowie ost- und westdeutschen Unterschieden auf Sexualität. Sie spielen in der Tat eine Rolle. Nachdem Persönlichkeitsmerkmale als Kontrollvariablen

einbezogen wurden, verbesserte sich das Schätzmodell deutlich und verlagerte somit den Schwerpunkt von wirtschaftlichen und sozialen Variablen hin zu psychologische Determinanten. Dies untermauert die Idee von Lundberg (2011), dass Persönlichkeitsmerkmale einen entscheidenden Beitrag zur Erklärung demografischer Ereignisse leisten können.

Alle drei Kapitel der Dissertation sind miteinander durch die wichtigen Konzepte Geschlecht und Beziehungsstatus verbunden. Über eine Vielzahl von Ereignissen hinweg zeigt das Geschlecht tiefgreifende Unterschiede auf und die Debatte darüber, welcher Anteil dieser Unterschiede auf Institutionen, Sozialisation oder Genetik zurückzuführen ist, dauert an (z.B. Goldin 1990, Guiso et al. 2008, Gneezy et al. 2009). Das erste Kapitel über Renteneintrittsentscheidungen zeigt, dass das Geschlecht einen entscheidenden Einfluss für den Zeitpunkt des Ruhestands hat. Das dritte Kapitel zeigt, dass die Sexualität von Männern und Frauen durch asymmetrische Geschlechterrollen und eine sexuelle Doppelmoral geprägt ist. Entscheidungen in Bezug auf Empfängnisverhütung und die Folgen einer Schwangerschaft werden weitgehend von den Frauen selbst getragen. Das zweite Kapitel zu religiösen Werten und Fertilitätsverhalten befasst sich daher ausschließlich mit Frauen. In allen drei Kapiteln der Dissertation wird der Beziehungsstatus einer Person als wichtige Determinante wirtschaftlicher Entscheidungen sowie für Sexual- und Verhütungsverhalten berücksichtigt. In Kapitel 1 zeigt sich, dass Single zu sein, in Partnerschaft zu leben oder verheiratet zu sein Auswirkungen darauf hat, wie viel Zeit auf dem Arbeitsmarkt angeboten wird, beispielsweise beim Renteneintritt. In Kapitel 2 zeigt sich, dass das Verhütungsverhalten - insbesondere Entscheidungen über den Zeitpunkt der ersten Geburt - stark davon abhängt, ob die Frau in einer Partnerschaft lebt oder Single ist. Kapitel 3 zeigt die bedeutende Rolle von Beziehungsdauer und Ehe im Bereich der Sexualität.

Die in dieser Dissertation verwendeten Daten stammen aus zwei großen und repräsentativen Bevölkerungsumfragen: dem Sozio-oekonomischen Panel (SOEP) und dem Deutschen Beziehungs- und Familienpanel (pairfam). Beide Datensätze liefern Informationen zum menschlichen Verhalten auf individueller Ebene und eignen sich besonders gut, um Forschungsfragen in der Bevölkerungsökonomie zu untersuchen. Das SOEP eignet sich gut für die Analyse sozialer Phänomene im Arbeitsmarktbereich und damit für das Thema im ersten Kapitel über Konflikte mit dem Vorgesetzten und Renteneintrittsentscheidungen. Das Pairfam ist eine einzigartige Informationsquelle zu Familien- und Partnerschaftsfragen und besonders geeignet für das zweite und dritte Kapitel über Fertilität und Sexualität. Diese großen und repräsentativen Datensätze ermöglichen die Analyse mit komplexeren statistischen Methoden, die in klinischen Studien mit kleiner Stichprobengröße nicht angewandt werden können.

In allen Kapiteln werden random-effects Schätzungen verwendet, mit denen zeitkonstante Determinanten in die Analyse einbezogen und gleichzeitig der Längsschnittcharakter der Daten berücksichtigt wird. Die Analyse von konkurrierenden Fertilitätsereignissen (Fehlgeburt, Abtreibung, Lebendgeburt) in Kapitel 2 und zur gewünschten Häufigkeit des Geschlechtsverkehrs (gleich, weniger, mehr) in Kapitel 3 werden durch Anwendung multinominaler Logit-Modelle berücksichtigt. Da Gesundheitsfaktoren nicht nur direkte, sondern auch indirekte Auswirkungen auf die Renteneintrittsentscheidungen haben können, modelliert das erste Kapitel die moderierende Rolle von Gesundheit und zwischenmenschlichen Konflikten über einen Interaktionseffekt.

Der Beitrag dieser Dissertation besteht in der Einbindung sozialer und psychologischer Konzepte in wirtschaftswissenschaftliche Analysen sowie in der Anwendung von wirtschaftstheoretischen Überlegungen in Forschungsthemen außerhalb des wirtschaftswissenschaftlichen Kontexts. Die Ergebnisse der drei Kapitel zeigen, dass der multidisziplinäre Ansatz eine bessere Vorhersage des menschlichen Verhaltens liefert als es die einzelnen Disziplinen für sich allein vermögen. Die Ergebnisse im ersten Kapitel zeigen, dass sowohl Konflikte mit Vorgesetzten als auch der Gesundheitszustand des Einzelnen eine wichtige Rolle bei Renteneintrittsentscheidungen spielen. Das Kapitel trägt zum Forschungsstand bei, indem es die moderierende Rolle der Gesundheit bei der Renteneintrittsentscheidung aufzeigt: Für alle Mitarbeiter wird der Renteneintritt wahrscheinlicher, wenn sie Konflikte mit ihrem Vorgesetzten haben. Doch für Beschäftigte mit gutem Gesundheitszustand werden Renteneintrittspläne dann deutlich früher akut als das bei Beschäftigten mit schlechterem Gesundheitszustand der Fall ist. Eine gute Gesundheit ist folglich eine notwendige, nicht aber eine ausreichende Voraussetzung für die Weiterarbeit. Die wichtigsten Ergebnisse des zweiten Kapitels zeigen einen signifikanten Einfluss der Religion auf Verhütungsverhalten und Fertilitätsentscheidungen. Ein Großteil der Forschung zu Religion und Fertilität stammt aus den USA. Kapitel 2 ergänzt diesen Forschungsstand mit aktuellen Befunden aus Deutschland. Darüber hinaus trägt das Kapitel dazu bei, Fehlgeburten und Schwangerschaftsabbrüche in das Fertilitätsmodell zu integrieren, anstatt die Analyse auf Geburten zu beschränken. Dabei profitiert Kapitel 2 von umfangreichen prospektiven Daten aus pairfam zur Fertilitätsbiographie. Das dritte Kapitel bietet einen theoretischen Ansatz, wie psychologische Variablen in einem wirtschaftlichen Rahmen einbezogen werden können, um damit das sexuelle Wohlbefinden zu analysieren. Nach dieser Theorie kann die Persönlichkeit von zweifacher Bedeutung sein: indem sie die Vorlieben einer Person für Sex sowie das Verhalten einer Person in einer sexuellen Beziehung beeinflusst. Die Ergebnisse der ökonometrischen Analyse zeigen negative Auswirkungen von Neurotizismus auf das sexuelle Wohlbefinden, während Gewissenhaftigkeit eine Win-Win-Situation für ein Paar zu schaffen scheint. Extraversionen und Offenheit wirken sich nicht eindeutig auf Paarbeziehungen aus, weil sie einerseits

das sexuelle Wohlbefinden verbessern, aber andererseits zu Bindungsproblemen führen können. Verträgliche Personen scheinen interessanterweise sexuelles Wohlbefinden zu erlangen, obwohl sie in der sexuellen Kommunikation schlechter abschneiden.

List of Publications

Chapter 1 - Retirement Intentions: The Role of Conflict with the Boss and Health

Published in: Sozialer Fortschritt, Bd. 66 (2017), Heft 10: S. 699–672.

Chapter 2 - Religion Predicting Fertility Behaviour of Young Women in Contemporary Germany

Working Paper in:

Research Papers in Economics No. 7/20, Universität Trier, Empirische Wirtschaftsforschung

Chapter 3 - Big Five Personality Traits and Sex (*mit Prof. Dr. Uwe Jirjahn*)

Working Paper in:

IZA DP No. 13894, 2020

GLO Discussion Paper, No, 720, 2020