"Two people gotta stick together..."
Four essays on the interrelationship between marriage-related and economic decisions

Inauguraldissertation
zur Erlangung des akademischen Grades
Doktor rerum politicarum

der Technischen Universität Dortmund

vorgelegt von
Diplom-Volkswirtin Stefanie Neimann

16. Juli 2010

Acknowledgements

This thesis is based on research that I did while being a doctoral student of the *Ruhr Graduate School in Economics (RGS Econ)*. During this time I profited from excellent working conditions and sound financial assistance by the RGS. I am especially grateful to my cohort fellows *Leilanie Basilio*, *Yiquan Gu*, *Jan Heufer*, *Vivien Procher*, *Ute Volz*, and *Tobias Wenzel* for a great team atmosphere, helpful comments and their permanent encouragement. I also thank our coordinator *Stefan Rumpf* for all his effort.

My special thanks go to my supervisor and co-author *Kornelius Kraft* for his support, suggestions, and constructive criticism. He and the *Technische Universität Dortmund* also provided me with all the necessary equipment for writing this dissertation. The thesis further benefited from discussions at the Brown Bag Seminar in Dortmund and several national and international conferences. Moreover, I want to thank my colleagues from the chair, *Stefan Giesen*, *Rafael Gralla* and *Julia Lang*, for all the help and support they gave me in everyday work life.

I am deeply indebted to *Hendrik Schmitz*. I benefited from his econometric knowledge and stimulating discussions as his co-author and from his numerous critical comments on all chapters of this thesis. However, most of all, I thank him for always believing in me.
Finally, I am grateful to my parents *Christiane and Ulrich Neimann* and my sister *Charlotte*. With their permanent faith and inimitable humor, they always offer me invaluable backing.

The title of this thesis was inspired by Tina Turner's amazing song.

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Chapter 1

Introduction

1.1 The family in economics

Economic theory and empirical research traditionally concentrate on the impact of economic incentives on individual's decision-making. Interdependencies between own choices and those of family members are often neglected. However, members of the same household probably affect each other. They share resources, and they jointly produce household commodities like children, meals, and love (see Becker, 1973). Moreover, they care for each other and probably have a preference to spend time together which in turn may induce them to pay costs which might not be rational from the pure egoistic point of view. At the same time, economic decisions may alter the advantageousness of a marriage compared to staying single or getting divorced. Thus, neglecting the component in life which is most important for most people (see Section 1.2) can lead to biased theoretical and empirical predictions concerning individual's decision-making process. For the last 15 years, a growing number of economists have been dealing with this problem. They have developed theories that model the behavior of a family taking into account that each member may have egoistic and altruistic intentions (see e.g. Browning et al., 1994). Moreover, the improved availability of data sets that provide information for several household members at the same time has enabled researchers to obtain a better idea on the impact of the household context in real life. However, there are still open questions concerning the interrelationship between individual economic and family-related decisions.
The present thesis attempts to bridge part of this gap by analyzing the behavior of couples in Germany. First, I study the influence of the spouse on two specific economic decisions, namely the decision to pursue a healthy behavior and to work at an older age. The second part deals with the effect of spousal characteristics on the risk of marital disruption. More precisely, I estimate whether similarity between two spouses with respect to education and religiousness makes a marriage more stable, and how the labor division between husband and wife affects marital stability. Even though I take into account that children also play a vital role in the household, my focus is on the two spouses. The reason is that the latter should be the ones with the highest decision power within the household and, moreover, they are usually confronted with similar economic decisions like labor force participation.

The remainder of this introduction comprises some descriptive statistics about families in Germany (Section 1.2), a short explanation of the data used in this thesis throughout all chapters (Section 1.3), and in Section 1.4, I give a short summary of all parts of the thesis.

1.2 Families in Germany

In Germany, the Basic Law declares in Article 6 that marriage and family are under the State's special protection. However, there is an ongoing public debate whether and, if so, how this claim can be settled given the substantial changes in family lives over the last 40 years. The attractiveness of a traditional family consisting of a married couple and several children seems to decrease: birth rates decline, the prevalence of cohabitation increases, and divorce rates are on a persistently high level.

Table 1.1: Marriages and divorces in Germany

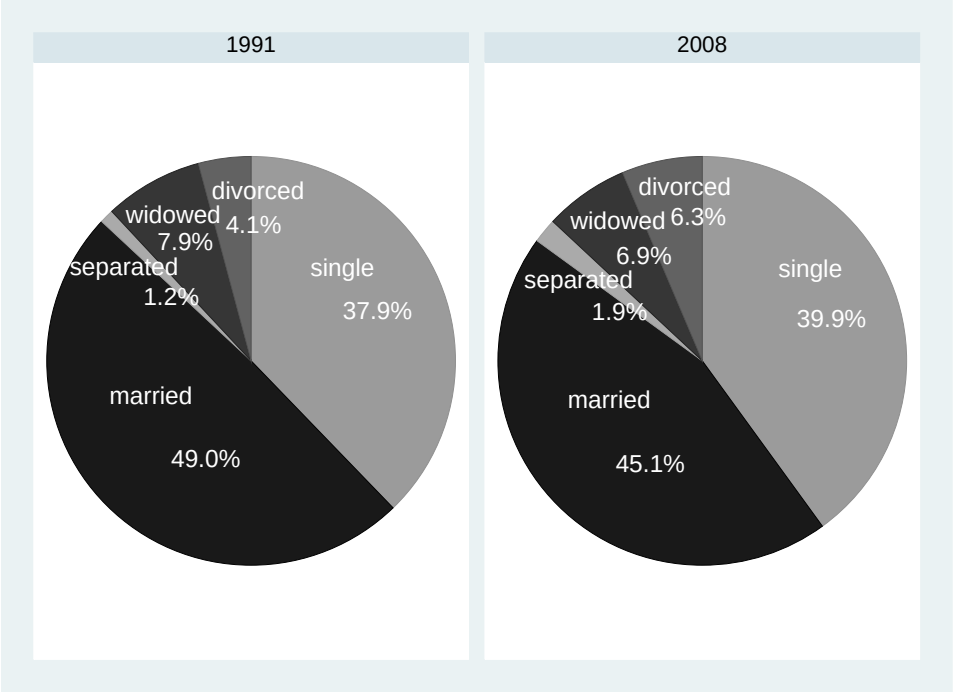
	Marriages		Divorces	
	total no.	per 1,000	total no.	per 1,000
Year	in 1,000	inhabitants	in 1,000	inhabitants
1950	750	11.0	135	2.0
1960	689	9.5	73	1.0
1970	575	7.4	104	1.3
1980	497	6.3	141	1.8
1990	516	6.5	155	2.0
1995	431	5.3	169	2.1
2000	419	5.1	194	2.4
2002	392	4.8	204	2.5
2004	396	4.8	214	2.6
2005	388	4.7	202	2.5
2006	374	4.5	191	2.3
2007	369	4.5	187	2.3
2008	377	4.6	192	2.3

Source: Statistisches Bundesamt (2008, 2009a)

For instance, Table 1.1 shows the development of marriages and divorces in Germany. In 2008, about 377.000 couples married, whereas 192.000 got divorced. This means that the number of marriages has decreased by 50 % compared to 1950. The ratio per 1,000 inhabitants has even declined from 11.0 to 4.6. At the same time, the number of divorces per 1,000 inhabitants has more than doubled between 1960 and 2000, however, it has remained rather constant around 2.4 in the last 8 years. This change in family life is also reflected in Figure 1.1. It shows the distribution of the German population in 1991 and 2008 by marital states. The proportion of married individuals has declined from almost 49 % to 45 %, whereas separated and divorced people make up now 8.2 % compared to 5.3 % in 1991. Moreover, the proportion of singles has increased by two percentage points.

However, even though marriage and having children have become less prevalent, these trends do not necessarily mean that family have become less important

Figure 1.1: Distribution of marital states in 1991 and 2008



Source: Statistisches Bundesamt (2009b)

for individuals. Table 1.2 shows results of interview questions from 2008 asking about the significance of different aspects in life. The numbers give the proportions of individuals who state that a respective life facet is "very important" or "important" for them, differentiated by marital status.

Leading a happy marriage or partnership is important or very important for more than 99 % of married people. Moreover, even 87 % of singles, 82 % of separated and divorced, and 72 % of widowed individuals state this. The importance is, however, lower for divorced and widowed women than for men. In addition, for older people, this aspect seems to be less relevant. Despite declining birth rates, "to have children" is still an important element in life, for 91 % of the married and for 58 % of singles. Women are in each case more affiliated to children than men. Nevertheless, having children seems to be less relevant than experiencing a happy partnership.
These questions are part of the German Socio-Economic Panel which also provides the data for this thesis. Therefore, in the next section, the advantageousness of this data set is discussed in further detail.

Table 1.2: Importance of different aspects in life (2008)

	% stating "Very important"/"Important"			
	Married	Single	Sep./Div.	Widowed
Happy partnership				
Total	99.10	86.94	81.70	72.20
Men	99.04	84.87	84.07	76.24
Women	99.15	89.14	80.00	71.05
Age groups				
Age 16–30	98.78	91.67	97.22	no obs.
Age 31–45	99.58	86.07	89.23	90.48
Age 46–60	99.16	67.49	84.28	80.77
Older than 60	98.67	41.96	63.83	70.36
To have children				
Total	90.81	58.28	77.59	88.00
Men	89.79	52.10	67.82	85.95
Women	91.83	64.78	84.58	88.57
Age groups				
Age 16–30	93.47	62.69	86.11	no obs.
Age 31–45	92.24	57.69	81.79	100.00
Age 46–60	89.53	29.00	76.09	84.62
Older than 60	90.74	34.51	73.96	88.14
To be there for others	92.48	91.81	90.93	88.93
Polit./Social particip.	21.78	19.50	19.74	18.08
To afford something	83.07	87.68	79.36	72.78
To develop oneself	61.57	83.51	67.62	46.50
Success at work	67.64	86.79	73.38	40.13
Own house	63.90	41.39	30.09	46.73
Traveling	39.14	51.10	39.70	32.80

Source: SOEP, 2008; own calculations

1.3 Data

Throughout all chapters of this thesis, data from the German Socio-Economic Panel (SOEP) is used. The advantages of this data set provided by the DIW Berlin are manifold. Therefore, I will only stress the most important aspects for my research questions. For more detailed information about the SOEP, see e.g. Wagner et al. (2007).
First, the SOEP is a rather long (and still ongoing) time series with 25 waves in 2009. For marital-related research, it is essential that couples can be followed over a long period. For Chapters 4 and 5, it is particularly important that I am able to identify when couples get married and to observe them in the course of their marriage until they potentially get separated. Second, not only the head of the household, but all adult household members are asked the full questionnaire. Thus, in all estimations, I can include individual information of both spouses, which makes the SOEP of great value. Moreover, it allows for a considerable sample size. The original sample of 1984 consisted of about 6,000 household and 12,000 individuals. In 2008, almost 11,000 households and more than 20,000 individuals were sampled. Since I focus on couples and in addition, on couples in the age range from 50 to 65 (Chapter 3) or that marry during the observation period (Chapters 4 and 5), only a comprehensive data set like the SOEP makes it possible to carry out reasonable estimations. Another important aspect are the numerous socio-economic characteristics that I can either analyze or control for. The SOEP contains a wide range of variables including various health indicators, monthly calendars about labor force participation, and time use questions.

The data used in all chapters was extracted using the Add-On package PanelWhiz v2.0 Nov. 2007 for Stata. PanelWhiz (http://www.PanelWhiz.eu) was written by John P. Haisken-DeNew (john@PanelWhiz.eu). For more information about it, see Haisken-DeNew and Hahn (2006). Any data or computational errors are my own.

1.4 Overview and summary of findings

This thesis consists of two parts. Part I deals with the impact of the spouse on individual economic decisions. In contrast, the second part analyses the influence of economic factors on the decision to divorce.

Chapter 2 (**“ “Honey, why don’t you see a doctor?” – The spousal impact on health behavior”** - co-authored by Hendrik Schmitz) contains an analysis on how two spouses influence each other’s health behavior. Married in-

dividuals are usually found to be in better health than singles but it is not fully known why this is the case. We test one possible explanation, namely that both spouses encourage each other to a health-promoting behavior and keep an eye on each other. Family health production models predict that spouses invest in each other's health since they, on the one hand, care about each other and, on the other hand, depend on each other's wage earning and housework capacity. We regard own health behavior as a good proxy for control efforts and expect therefore a positive correlation between the two spouses' health activities. Nevertheless, any observed correlation can be induced by other factors than the direct effect. In addition to observable characteristics like the health status, age, and income, unobservable elements like the shared environment and assortative mating could account for it. Therefore, we estimate the probability to observe a certain health behavior as a function of the spouse's behavior and various other socio-economic factors. Moreover, in order to rule out biases in the partner's direct effect due to shared environmental factors and correlated preferences we use simultaneous equations models incorporating fixed effects. Furthermore, since individuals with a healthy lifestyle might have a higher probability to be in a relationship, we address this potential bias by including sample selection corrections. Our indicators of health behavior are the probability to go to the doctor within a period of three months, to do sports at least once a week, and to follow a health-conscious diet. While we find no causal effect regarding eating-habits, the impact of the partner's being engaged in sports is substantial. Moreover, females affect their male spouses in seeking medical advice but not vice versa. The latter result may explain why men usually benefit more from marriage than women.

In Chapter 3 (**"The spousal impact on labor force behavior: New evidence for older married couples in Germany"**), the working behavior of married couples aged 50 to 65 is described and investigated. The analysis focuses on the relationship between the individual decision to retire and the spouse's characteristics, in particular, the partner's employment status. Since two spouses usually share resources and care about each other to some degree, they probably face a different optimization problem than a single person. Moreover, they may have a preference to spend leisure time together and therefore, try to coordinate their working behavior. Given the increasing proportion of dual-worker couples it becomes increasingly important to know more about the interdependencies in the labor force participation decision of older spouses.
Following Blau (1997, 1998) and Blau and Riphahn (1999), I estimate transition probabilities out of discrete labor force states that depend on the employment states of the two spouses. Thus, I estimate probabilities to stop and to start working given the employment status of the spouse and controlling for a large

set of financial, health, and occupational characteristics of both partners. My results suggest that the spouse is indeed an important factor in the employment decision. Even after controlling for age, wage, health status etc., the probability of one spouse to stop working is much higher if the other spouse is already out of employment than if he/she is employed. By further differentiating between retirement and unemployment, I show that the probability to retire is substantially higher if the spouse is also retired compared to the situation where the spouse is employed. There seems to be a preference to share one's retirement. In contrast, the husband's probability to become unemployed does not seem to depend on the wife's labor force status. However, the wife's probability is higher if her husband is still employed.
In addition, I find evidence for cross-spouse effects, in particular for husbands. Their probability to leave employment is significantly affected by the wife's wage and benefits. The spouse's health status is another factor that alters the working decision for both, men and women.

Part II deals with divorce determinants. Gary Becker's "Theory of Marriage" (Becker, 1973; Becker et al., 1977) makes various predictions about spousal characteristics and combinations that should increase marital stability. First, individuals can gain from marriage compared to staying single because spouses are able to specialize in market and domestic work. By labor division, they can raise their consumption of household commodities which in turn provides the major incentive to stay together. Consequently, every factor that makes specialization between two spouses less advantageous increases the risk of separation. He further shows that positive assortative mating is optimal concerning all factors that are complements in the household production. Examples are age, attitudes, and intelligence. However, in particular for Germany, there is little empirical evidence whether some of his major hypotheses actually hold.

In Chapter 4 (**"Impact of educational and religious homogamy on marital stability"** - co-authored by Kornelius Kraft), we test whether spouses who are similar to each other in certain respects have a lower probability of divorce than dissimilar spouses. We focus on the effect of homogamy with respect to education and church attendance. The impact of educational similarity is a priori not clear. On the one hand, education has a huge impact on the individual's wage earnings capacity. Since homogamy in this respect makes labor division less advantageous, homogamy in education should increase the divorce probability. On the other hand, education contains a social and cultural element. From this point of view, similarity should have a stabilizing effect. Concerning religiousness, Becker's household model predicts that positive assortative mating is optimal.
Our results, however, suggest that homogamy per se does not have a positive

effect whereas higher education and religiousness do have. Two low-educated spouses have a higher risk of separation than any other educational combination. Moreover, marriages where both spouses attend church services are more stable than those with two non-attending spouses or where only one partner participates. In contrast to previous studies for US couples, our results suggest that it does not matter whether the wife or the husband is higher educated.

In Chapter 5 (**"Effect of labor division between wife and husband on the risk of divorce: Evidence from German data"** - co-authored by Kornelius Kraft), we directly estimate the impact of labor division between husband and wife on the risk of divorce. Becker's theory of marriage assumes that specialization in domestic and market work reduces the risk of separation. In principle, it should not matter whether the husband or the wife participates in the labor force as long as he or she is able to derive a higher wage income. In fact, female labor force participation and wages have risen substantially in the last decades and egalitarian gender attitudes are more common today. Nevertheless, traditionally, the breadwinner role is assigned to the husband, whereas housework remains primarily a female's domain.
In order to test the effect of specialization, we do not simple consider the wife's labor force status. On the one hand, we define her labor income as proportion of total household income and on the other hand, we use the proportion of total time used for housework as variables of main interest. Our results suggest that the labor division can have an effect on the risk of divorce whereas specialization per se is not stability-enhancing. We rather find gender-specific differences. Female breadwinner-couples have a substantially higher risk of divorce than male breadwinner-couples. Moreover, marital stability is also considerably reduced if the wife has to bear the double burden of market and housework which we cannot find if the husband bears it. Interestingly, an equal division does not significantly alter the probability of separation.

Part I

Spousal impact on economic decisions

Chapter 2

"Honey, why don't you see a doctor?" – The spousal impact on health behavior[1]

[1]This chapter is based on an unpublished manuscript of the same title, co-authored by Hendrik Schmitz.

2.1 Introduction

A great deal of research in economics but also other disciplines like medical sciences, psychology, and sociology consistently finds that married people live longer, and are healthier and happier than non-married individuals. For example, Blanchflower and Oswald (2004) estimate that the effect of being married on happiness is equal to an extra income of $100,000 a year. Moreover, men seem to benefit more from marriage than women. For example, comparing death rates from 16 developed countries Hu and Goldman (1990) find that the relative mortality rates of unmarried men compared to married range from 1.6 to 3 with an average of 2. For women, the ratio is on average 1.5, with only Taiwan and Japan having rates above 2.

This phenomenon can to some extent be explained by selection of healthier individuals into marriage. Nevertheless, despite methodological weaknesses that can be found in the existing literature (Ribar, 2004), there is evidence that it cannot be solely attributed to selection (see, e.g., Lillard and Panis, 1996; Brockmann and Klein, 2004). Marriage itself seems to be health-promoting but it is not fully understood how. Some see the emotional support as a key factor (see, e.g., Berkman, 1995), another explanation can be a higher real income for married individuals (by using economies of scale and specialization gains) which in turn improves the health status (Trovato and Lauris, 1989).[2]

In this paper, we analyze another factor that could further explain why couples are in better health than singles: spouses encourage each other to a health-promoting behavior and keep an eye on it. Family health production models (e.g. by Jacobson, 2000, or Wilson, 2002) predict that spouses invest in each other's wellbeing since they care about each other, and because they depend on each other's wage earnings and housework capacity. Hazardous behavior leads to a reduction in the family's income and, therefore, all family members have an incentive to keep each other in good health, in particular the breadwinner's status.

Own health behavior could be seen as a good proxy for motivation and control efforts towards the partner. Therefore, a positive correlation in the spouse's health activities would support theoretical predictions. However, this correlation might result from other factors than the causal influence of the spouse (see Manski, 1995; Wilson, 2002). First, two spouses share an environment that may induce both to engage in healthy behavior. For instance, they receive the same information about health risks from their environment, or they get reminders from the same doctor for preventive check-ups. Another explanation for spousal similarity

[2] See Wilson and Oswald (2005) for a survey of the longitudinal evidence how marriage affects physical and psychological health.

is positive assortative mating. That is, individuals tend to marry a person who has the same preferences and characteristics, in this case a healthy or unhealthy lifestyle. There is clear evidence that spouses have similar characteristics and behave similarly (see e.g. Nielsen and Svarer, 2006 for assortative mating in education and Jenkins and Osberg, 2005 concerning leisure activities). With respect to health, Clark and Etilé (2006) find that positive assortative mating is the only relevant factor for the observed correlation in spouses' smoking behavior.

To our knowledge, no study has ever investigated direct spousal effects on health-improving behavior. Health economists have largely neglected the marriage-health relationship, whereas the sociological, psychological, and medical literature has focused on differences in mortality rates and physical health between married and non-married people. There are only two studies by Umberson (1992) and Markey et al. (2007) analyzing the individual's perception concerning the spousal impact on own health behavior. Both find evidence that people think that the partner motivates to health-improving activities and monitors them. However, both studies are based on cross-sectional data, and they do not account for spousal interdependencies. Given the enormous challenges health care systems in all industrialized countries are faced with, it becomes increasingly important to get a better understanding why some groups in a society have a higher probability to fall ill than others. A great potential to contain health care expenditures consists in reducing the incidence of wide-spread diseases like cardiovascular disease or diabetes which can effectively be prevented by health-promoting behavior. In order to design optimal programs to enhance the health-conscious behavior of individuals, it is essential to get to know more about how family members affect each other in that respect, in particular, given the increase in single households in recent years.

Our aim is to analyze whether the partner's health behavior has any direct impact on own health activities. Our indicators are the probability to go to the doctor within a period of three months, to do sports at least once a week, and to follow a health-conscious diet. Thus, we estimate the probability to observe a certain behavior as a function of the spouse's behavior and various own characteristics like health status or health insurance patterns. In order to rule out biases in the partner's direct effect due to shared (unobserved) environmental factors and correlated (unobserved) preferences we estimate simultaneous equations models incorporating fixed effects. Furthermore, since individuals with a healthy lifestyle might have a higher probability to be in a relationship, we address this potential bias by including sample selection corrections.
The database is the German Socioeconomic Panel (SOEP) from 1995 to 2008. For all three indicators, the probability of a health-improving behavior is pos-

itively correlated with the spouse's behavior even after controlling for various socio-economic factors. Simultaneous equations models with fixed effects show, however, that positive assortative mating can largely explain this correlation. The shared environment is only relevant for the man's influence on her probability to go to the doctor. Nevertheless, we also find evidence for a direct effect of the partner's behavior but not for all types of health activities. Doing sports is largely influenced by the partner's behavior for both, men and women. In contrast, following a healthy diet does not affect eating habits of the partner significantly. As regards seeking medical advice, we find a gender-specific difference: women induce their partner to go to the doctor but not vice versa. The last result can explain the common finding that men benefit more from marriage than women. Moreover, since the male breadwinner model is still prevalent in Germany, it confirms the theoretical prediction that the main earner's health status is more relevant for the family.

The Chapter proceeds as follows: Section 2.2 reviews theoretical foundations and previous empirical studies of spouses' health behavior. Section 2.3 explains the empirical strategy and data used, while Section 2.4 reports the estimation results. Section 2.5 concludes.

2.2 Theoretical background and previous empirical results

In the following, we briefly discuss potential explanations for the observed correlation in spouses' health behavior. These include a shared environment, assortative mating, and a direct spousal influence.

2.2.1 Shared environment and assortative mating

The first argument that may account for the correlation is that a married couple usually lives together in the same environment. For example, an infectious disease can be the reason that both spouses have to go to the doctor. Moreover, spouses largely receive the same information about health risks which may result in similar incentives for a medical check-up or for doing sports. They are also likely to have the same health insurance, and to see the same physicians. Consequently, they may be exposed to the same physician-induced demand (if there is any) that might lead to a higher probability of visiting the doctor for both spouses. In summary, there are several health-related environmental factors that may affect both spouses at the same time. Some of them are observed and can

be controlled for by the researcher like health status or type of health insurance. In our estimations, the unobserved factors are captured by the time-variant error terms in the wife's and husband's estimation equations that are allowed to be correlated.

The interrelationship between two spouses' health behavior may also result from assortative mating. The term is mainly determined by Gary Becker's theory of marriage that provides a theoretical framework for the analysis of family's decision-making (Becker, 1973, 1981). Positive assortative mating means that individuals tend to marry a person who has the same attitudes and characteristics. Thus, it is very likely that two individuals match who have the same preference for a health-conscious behavior. Since these preferences are usually unobserved, we could misleadingly interpret a correlation in their activities as direct influence from the spouse even though it is due to assortative mating.
There is already a great deal of evidence showing that assortative mating is relevant. Concerning health issues, Clark and Etilé (2006) examine which factors induce the observed correlation in spouses' cigarette smoking behavior. They conclude that the correlation in smoking can be fully attributed to positive assortative mating. We control for this potential bias in our analysis by including individual-specific fixed effects.

2.2.2 Spousal influence: The family as health producer

Studies of health demand are usually based on the model of Grossman (1972). He first interprets health as human capital stock that, on the one hand, is subject to depreciation and, on the other hand, determines the total amount of time an individual can use for earning money and producing commodities. Investments in own health consist of own time and market goods like medical services as input factors. Health is demanded by the consumer for two reasons. First, it directly enters the utility function, i.e. sick days are a source of disutility (health as consumption commodity). Second, it determines total time available for market and non-market activities (health as investment commodity). The first-order optimality condition for gross investment requires that the present value of marginal investment costs must equal the present value of marginal benefits.

Jacobson (2000) analyzes the Grossman model from a family perspective. She interprets the family as producer of health rather than the individual. That is, each family member is the producer of own health and the health of other family members.[3] Moreover, not only own income and wealth but earnings of all

[3] In the following, we neglect the model's implication for child health.

family members can be used in the production of health. As with investments in own health, each individual receives investment and consumption benefits from investments in the spouse's condition. Investment benefits arise because improved health will decrease future time spent sick and increase family time available for market work. Moreover, the health status may also affect the wage rate. Both aspects should lead to a higher family income and hence, higher consumption and investment possibilities for both spouses. Consumption benefits result if an individual derives direct utility from the spouse's health, i.e., he or she cares about the mate's well-being.
Following Becker (1973), she assumes that all family members have common preferences, i.e., a joint utility function. Her main result is that the family will not try to equalize marginal benefits and marginal costs of health capital for each family member. They will rather invest in health until the ratio of marginal (lifetime) utility of health to the effective price of health is equal for all family members. They will not try to equalize the amount of health capital between the two spouses. For example, the one whose wage income is more sensitive to changes in health will enjoy higher investments. Bolin et al. (2001, 2002) extend Jacobson's model by explicitly allowing for conflicting preferences. They also regard the family as producer of health but assume that spouses are Nash-bargainers or act strategically. Their results support Jacobson's findings: Both spouses invest in own and the other spouse's health. Moreover, the one with the higher wage will receive higher investments in health capital by the family.

Wilson (2002) also combines Becker's theory of marriage and Grossman's health capital model. He develops a simple two-period life-cycle model about health capital formation within a marriage that emphasizes the role of marital sorting. He neither assumes a joint utility function nor does he explicitly model a bargaining process. The individual utility functions of the two spouses are linked because utility directly depends on the spouse's health and indirectly via the family's budget constraint since the health status affects the wage income. His main implication is that the spouses' health states are positively correlated because of assortative mating, shared lifestyle and environmental risk factors, and direct health effects. Examples for direct spousal influences are infectious diseases or stress induced by the illness of the partner. Wilson (2002) tests his hypotheses by regressing the individual's and spouse's characteristics and health behavior indicators (smoking, drinking, exercise) on the individual's health status. He finds that the effect of spouse's characteristics and behavior are in general small and statistically insignificant. However, his analysis is based on cross-sectional data and does not account for endogeneity problems. Moreover, he focuses on health status, not health behavior. Similarly, Khwaja et al. (2006) look at the effect of

the spouse's health status on the individual's decision to smoke using data from the Health and Retirement Study. They find evidence that consumption externalities reduce smoking while altruism and learning have no effect. However, they do not analyze interdependencies in health activities.

Concerning the impact of the partner's health behavior on own behavior, there are, to our knowledge, only two empirical studies. Both analyze the individual's feelings about the spouse's influence and control efforts. Umberson (1992) uses data from a US panel survey where interviewees were directly asked how often anyone had monitored his or her health behavior and who had done this. She shows that married people are more likely to be subject to health control efforts, and the wife is more likely to be the controller of the husband than vice versa. She argues that the latter can explain why men usually gain more from marriage than women.
Using interview data from 105 US couples, Markey et al. (2007) also analyze individuals' perception concerning the spousal impact on their health. Both, men and women report experiencing more positive than negative health influences from their partners. The effects are highest for eating habits and physical activity but they also find a significant impact on the probability to go to the doctor. Both studies use cross-sectional data and do not consider spousal interdependencies.

2.3 Empirical strategy

2.3.1 Methodology

We want to estimate the spousal impact on health behavior as measured by the probability of seeing a doctor, doing sports at least once a week, and following a health-conscious diet. We capture the spousal's attitude towards preventive behavior by his/her observed behavior.

We therefore estimate the following equations for males (m) and females (f):

$$y_{mt} = \alpha_m y_{ft} + x'_{mt}\beta_m + c_m + \epsilon_{mt} \quad (2.1)$$

$$y_{ft} = \alpha_f y_{mt} + x'_{ft}\beta_f + c_f + \epsilon_{ft} \quad (2.2)$$

where y_{mt} and y_{ft} are binary indicators of the health behavior at time t, x_{mt} and x_{ft} are vectors of socio-economic variables, c_m and c_f are time-invariant unobserved effects, and ϵ_{mt} and ϵ_{ft} are time-varying error terms. We are particularly interested in α_m and α_f that measure the effect of the spouse's on own health behavior. In principle, (1) and (2) could be estimated separately (e.g. by OLS).

However, it is very likely that the time-varying error terms are correlated due to the shared environment as outlined in Section 2.2.1. For instance, spouses receive the same information about health risks, potentially affecting their behavior at the same time due to the same exogenous shocks. This would lead to biased estimates in the single equation setting. Therefore, we use a simultaneous equations model (SEM), estimated by two-stage least squares, to solve this problem. Identification is not a problem here since the x_{it} mainly contain person-specific variables. That is, when estimating equation (1) we compute $\hat{y}_{ft}$ as a function of the complete list of x_{ft} (and vice versa when estimating equation (2)).[4]
Although our indicators of health behavior are binary variables, we estimate linear models, that is, OLS as a benchmark and SEM to control for the simultaneity bias. One drawback of the linear model is that the estimated coefficients can imply probabilities outside the unit interval [0,1]. However, we regard this problem as less severe given that the linear model allows us to include a fixed effect which is potentially correlated with the explanatory variables.[5] We assume that unobserved individual frailty or time-constant preferences for a healthy lifestyle affect own health behavior. Moreover, it is very likely that spouses with similar preferences match. Consequently, the unobserved preferences of both partners are potentially correlated and, thus, also c_m and y_{ft} (and vice versa). Therefore, we estimate a fixed effects-SEM (FE-SEM) to rule out biases due to assortative mating.

Obviously, we can only include couples in our analysis and cannot consider singles. This might impose a selection problem. It is well known that married individuals are in better health than comparable singles, either due to the positive impact of marriage or due to selection of healthy individuals into marriage (or both). The econometric challenge is to include a sample selection correction into a panel data model that already accounts for fixed effects and endogenous explanatory variables. We follow the approach proposed by Semikyna and Wooldridge (2005) which was also used by Jaeckle and Himmler (2010). Therefore, we outline the method only briefly and refer to Semikyna and Wooldridge (2005) or Jaeckle and Himmler (2010) for a more detailed description. First, we estimate the selection equation which is represented as in Mundlak (1978), Chamberlain (1984), or

[4]The F-statistics of the first stage-regressions show that the person-specific variables are always highly jointly significant.

[5]Only in 0.2 % to 5 % of all observations (depending on the dependent variable) the predicted values after OLS-regression fall outside the range of [0,1]. This low number justifies using linear models instead of a binary choice model. Also see Angrist (2001) who makes a case for using 2SLS even if the dependent variable is binary when the parameter of interest is a causal effect.

Wooldridge (1995) to account for fixed effects:

$$s_{mt} = z'_{mt}\theta_{1m} + \bar{z}'_m\theta_{2m} + \nu_{mt} \quad (2.3)$$

$$s_{ft} = z'_{ft}\theta_{1f} + \bar{z}'_f\theta_{2f} + \nu_{ft} \quad (2.4)$$

where s_{mt} is the indicator of having a spouse (binary variable), z'_{mt} is a superset of x'_{mt}, and $\bar{z}'_m$ are the individual means of the z'_{mt}. The instruments we include in z'_{mt}, i.e., the variables that are assumed to affect the likelihood of having a partner but not the health behavior are a complete set of dummy variables for all 16 German federal states and indicators for the degree of agglomeration of the individual's hometown. We distinguish between agglomerated, urbanized, and rural areas with the latter as reference category. These variables also reflect regional differences in males-females ratios and, thus, the possibilities to find a spouse. On the other hand, they are unlikely to have an effect on the individual health behavior once we control for the full set of other important socio-economic characteristics.[6] Similar instruments were used by Clark and Etilé (2006).

Equations (3) and (4) are estimated separately for each year by probit regression models. The results are used to calculate inverse Mills ratios, λ_{mt} and λ_{ft}. The final estimation equations - where we again use the Mundlak-approach to express the fixed effect as a linear projection onto time averages of the explanatory variables and an error-term - are

$$y_{mt} = \alpha_m\hat{y}_{ft} + \alpha_{0m}\bar{\hat{y}}_f + x'_{mt}\beta_m + \bar{x}'_m\beta_{0m} + \xi_m\hat{\lambda}_{mt} + r_{mt} \quad (2.5)$$

$$y_{ft} = \alpha_f\hat{y}_{mt} + \alpha_{0f}\bar{\hat{y}}_m + x'_{ft}\beta_f + \bar{x}'_f\beta_{0f} + \xi_f\hat{\lambda}_{ft} + r_{ft} \quad (2.6)$$

where $\hat{y}_{ft}$ are the predicted values of y_{ft} from the first stage regression, $\bar{\hat{y}}_f$ are the individual means of the $\hat{y}_{ft}$, and $\bar{x}'_m$ are the individual means of x'_{mt}. Standard errors (clustered on individual level) are estimated by bootstrapping the entire procedure 500 times, thus taking into account that the inverse Mills ratio and the endogenous variables in (5) and (6) are predicted values from auxiliary regressions.

A test for differences in the coefficients

Since we interpret the changes in the coefficients across the different estimation techniques as indicator for the importance of assortative mating, the shared environment, and selection, we test whether the differences are significant. Using

[6] No further restrictions on the correlation between ϵ_{mt} and ν_{ms}, $s \neq t$ have to be imposed, as well as on the correlation between ν_{mt} and ν_{ms}, $s \neq t$. See Jaeckle and Himmler (2010), Semikyna and Wooldridge (2005), or Dustmann and Rochina-Barrachina (2007) for a further discussion about the underlying assumptions.

a bootstrap approach, we repeat the following procedure 500 times: (1) generate a bootstrap sample (while taking into account that individuals may have several observations in the panel); (2) estimate all four regressions and store the four coefficients on the spousal behavior; (3) calculate the pairwise differences in the coefficients. Finally, we sort the differences and check whether the 0 lies within the central 95 % of the differences. If this is the case we cannot reject the hypothesis that the two parameters are equal.

Note that this test is in the spirit of a Hausman-test for differences between the sets of coefficients of two different regressions. There is a general concern with the Hausman-test because it tests for differences in the coefficients *as a group*. Thus, it is likely that it rejects the equality of the group of parameters even if only one coefficient - not necessarily the one of major interest - differs strongly between the two regressions (see, e.g., Frondel and Vance, 2010). Since we are only interested in one coefficient, this property is undesirable in our case and therefore, we use the above outlined approach.

2.3.2 Data

The database for the empirical analysis is the SOEP. We use data from 1995-2008 because the self-rated health status that we include as a control variable is not available before 1995. Unfortunately, our three indicators of health behavior are not asked each year. Table 2.1 shows the availability of each indicator across time.

Table 2.1: Availability of Variables

Year	Doctor Visit	Weekly Sport	Healthy Diet
1995	x	x	
1996	x	x	
1997	x	x	
1998	x	x	
1999	x	x	
2000	x		
2001	x	x	
2002	x		
2003	x	x	
2004	x		x
2005	x	x	
2006	x		x
2007	x	x	
2008	x	x	x

Although the SOEP asks for the total number of doctor visits within the previous three months, we only use the binary information of having had at least one visit. The major reason is to use this variable as a proxy for prophylactic behavior. Although we do not have explicit information on preventive doctor visits, we assume that, conditional on the individual's health and insurance status, people who care more about their own health are also more likely to see a doctor. This effect can better be captured by the 0/1-decision than by the total number of visits in a quarter. Moreover, one usually interprets the observed number of doctor visits as a result of a two-stage decision-making process with the patient deciding about the first doctor visit (first stage) and the doctor - maybe together with the patient - deciding about the number of recalls, given at least one visit (second stage). Since the second stage also captures supply-side factors like physician-induced demand, we focus on the first stage where the individual has full control (Manning et al., 1981).
The question about the frequency of exercises was asked in most of the years. We consider doing sports at least once a week as engaging in healthy behavior. Following a health-conscious diet was only asked in 2004, 2006, and 2008. This binary variable takes on the value one when the extent to which the respondent follows a health conscious-diet is "much" or "very much" and a zero in case of "not so much" and "not at all".

Table 2.2 displays mean values of all three variables for males and females that live together with a partner compared to singles. We do not distinguish between married and unmarried but consider all couples where the two spouses live in the same household.[7] However, even though it would be interesting, we do not include same-sex couples since the number of observations would be too small to get any reasonable results. In total, we observe up to 13,277 couples with up to 85,791 couple-year observations. Since not each wave contains information on doing exercises and being on a healthy diet, the number of observations is smaller in these cases. The raw data do not give clear evidence that individuals who have a relationship behave in a healthier way than singles. For instance, single men are less likely to go to the doctor and to follow a healthy diet. However, their probability for doing sports is higher. In contrast, while women generally exhibit a healthier lifestyle than men, a large difference between singles and women with partners can only be found for eating habits. Single women are less likely to follow a healthy diet but, similar to men, have a slightly higher probability of engaging in sport activities. There is no difference in their likelihood of seeking medical help.

[7] Therefore, if we sometimes use the terms "husband" and "wife" we nevertheless refer to married and unmarried spouses in our sample.

Table 2.2: Sample means of health variables

Men	Doctor visit		Weekly sport		Healthy diet	
	cohab.	single	cohab.	single	cohab.	single
Mean	0.646	0.551	0.267	0.409	0.433	0.333
Person-year	85,791	32,977	55,334	21,245	20,091	7,761
Individuals	13,277	7,104	12,033	6,378	8,668	3,970
Women	**Doctor visit**		**Weekly sport**		**Healthy diet**	
	cohab.	single	cohab.	single	cohab.	single
Mean	0.753	0.754	0.286	0.308	0.622	0.539
Person-year	85,791	41,317	55,334	26,655	20,091	9,971
Individuals	13,277	8,420	12,033	7,607	8,668	4,914

Source: SOEP, own calculations

In our estimations, we control for an extensive set of factors that are also very likely to affect health behavior.[8] As health status indicators, we include the self-rated health status (dummies for "very good", "good", "bad", and "very bad", with "satisfactory" being the reference category), a dummy whether the individual had a hospital visit last year, and the degree of handicap. Furthermore, we distinguish between privately and publicly insured. As socio-economic factors we consider age, being a foreigner, years of education, number of children living in the household, whether the household lives in West Germany, and the household's log equivalence income. Concerning labor market behavior, we differentiate between full- and part-time employed, and unemployed, as well as between blue- and white-collar workers, self-employed, and whether the individual works in the health sector. We also include year dummies.

2.4 Results

Table 2.3 reports the estimation results for all three health indicators. It shows the different effects when using a simple OLS approach, OLS incorporating fixed effects (FE), simultaneous equations model with fixed effects (FE-SEM), and the FE-SEM-model controlling for selection. For the sake of brevity, we only report the coefficients for the spousal behavior. Full estimation results are reported in Tables 2.6-2.11 in Appendix 2.6.2. Note that each cell in the table results from

[8] See Appendix 2.6.1 for descriptive statistics.

a separate regression. Moreover, since we estimate linear probability models, the estimated coefficients are marginal effects.[9]

Table 2.3: Coefficients of spouse's health behavior

Men

Health indicator	OLS	FE	FE-SEM	FE-SEM Sel.	N
Doctor visit spouse	0.157***	0.099***	0.065**	0.064**	85,791
	(0.005)	(0.004)	(0.027)	(0.030)	
Weekly sports spouse	0.308***	0.188***	0.199**	0.195*	55,334
	(0.007)	(0.004)	(0.090)	(0.102)	
Healthy diet spouse	0.373***	0.258***	0.198	0.192	20,091
	(0.007)	(0.009)	(0.156)	(0.150)	

Women

Health indicator	OLS	FE	FE-SEM	FE-SEM Sel.	N
Doctor visit spouse	0.129***	0.083***	-0.028	-0.029	85,791
	(0.004)	(0.003)	(0.020)	(0.021)	
Weekly sports spouse	0.314***	0.213***	0.349***	0.343***	55,334
	(0.007)	(0.005)	(0.074)	(0.083)	
Healthy diet spouse	0.365***	0.259***	0.158	0.159	20,091
	(0.007)	(0.009)	(0.116)	(0.123)	

1) Standard errors in parentheses, clustered by individuals. Bootstrapped standard errors in selection models.
2) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
3) Full estimation results in Tables 2.6-2.11 in Appendix 2.6.2.

The first column (OLS) shows the spousal effect if we do not control for simultaneous exogenous shocks, assortative mating, and selection. We find a strong association between spouses' health behaviors. The likelihood of seeing a doctor in a period of three months is 16 (13) percentage points higher for men (women) if their partner also sees one. Even stronger are the results for physical activity and eating habits: the likelihood increases by 31 to 37 percentage points if the partner also engages in healthy behavior. As discussed before, these effects cannot be interpreted as causal but they indicate strong interdependencies.
Column 2 (FE) displays the results if we take assortative mating into account. For all indicators and for both sexes we find that it largely contributes to the high inter-spousal correlation. For example, concerning men's doing weekly sports the marginal effect of the spouse reduces from 31 to 19 percentage points, for

[9]We do not report the results of the single probit regressions for the inverse Mills ratios. They are available upon request. In almost all of these 54 regressions the instruments are highly jointly significant. Moreover, we do not present tables with the results of the tests for differences in the coefficients but just comment on them. They are available upon request, too.

women's healthy diet from 37 to 26 percentage points. The test for differences between coefficients across estimations (see Section 2.3.1) confirms that there are significant differences between the OLS and the FE coefficients in all six cases. Thus, positive assortative mating can explain the correlation to a large extent. Nevertheless, the coefficients of the spouse remain significant and substantial in all cases.

The third column (FE-SEM) shows the coefficients if we estimate the two equations simultaneously, thus allowing for correlated time-varying error terms. At first glance, the effects of the shared environment on health behavior seem to be important but the sign is not clear. Concerning doctor visits and a healthy diet, the spousal impact further decreases indicating that the shared environment positively contributes to the inter-spousal correlation. For physical activity, we find the opposite. However, the tests reveal that there are no significant differences between the FE and FE-SEM coefficients except in the case of female doctor visits. Thus, the shared environment does only play a significant role in the man's effect on the wife's probability to ask for medical help.

After controlling for fixed effects and ruling out simultaneity bias the spouse has no direct effect on the partner's eating behavior since the coefficients become insignificant. There are several possible explanations for this finding. For example, it could mirror that employed partners usually do not have lunch (and dinner) together but with their colleagues. Therefore, there are only limited possibilities for the partners to monitor and affect each other's eating habits. However, in either way, these results must be interpreted with caution. On the one hand, the still sizeable coefficients indicate that there might be direct effects but they are imprecisely estimated. Even though we observe 1,114 out of 8,668 couples where both spouses alter their eating behavior this might be too low to get precise effects.[10] Moreover, the test for differences between FE and FE-SEM estimations does not reject the hypothesis that both effects are the same. Thus, this result should be interpreted carefully.

In contrast, we find causal effects of the spouse for both seeing the doctor and exercising regularly even after controlling for fixed effects and the shared environment. Regarding sports, we find strong positive effects of both spouses on the partner's physical activity, with an even stronger effect of males' behavior on their partner. The husband's behavior increases the wife's probability by 35 percentage points, whereas the man's probability raises by 20 percentage points if his partner does sports. However, the size of the effect probably also reflects the preference of couples to spend their spare time together since doing sports is

[10]The FE-results are only identified by those couples where both change their behavior at least once in the observed time span.

a leisure activity. Concerning doctor visits, we find a gender-specific difference. Women induce their partner to go to the doctor (the probability increases by 6 percentage points) but not vice versa. The positive correlation in her OLS estimation can be fully explained by assortative mating and the shared environment. The reason for this might be that women already have a high likelihood to see the doctor in Germany. Moreover, visits to the gynecologist are included in the dependent variable which typically lead to regular doctor consultations. Thus, there is little scope for the husband to influence the wife's behavior. However, given that the male breadwinner model is still prevalent in Germany, husband's health status is also more important for the family from the economic point of view. Thus, our findings are in line with theoretical predictions by, e.g., Jacobson (2000).

Column 4 (FE-SEM Sel.) shows the coefficients if we additionally control for a potential selection into partnership, i.e., if we consider that there are factors that have an effect on health behavior and on the probability to be in a relationship at the same time. A comparison of columns 3 and 4 makes clear that a potential selection bias is not severe in our case. Not surprisingly, tests for differences show that the coefficients do not significantly change by the inclusion of the inverse Mills ratio. The reason is probably that we already consider fixed effects. Thus, only selection *conditional* on all observed covariates and the unobserved fixed effects is relevant. Nevertheless, Table 2.4 shows the effects of these ratios on health behavior. Note again that each cell in the table results from a separate regression. With the exception of women's eating behavior, we cannot reject that selection matters in our estimations. Remarkably, there seems to be positive and negative selection. If we neglect the insignificant result we find that women who are more likely to be in a relationship have also a higher probability to follow a healthy lifestyle. However, for men, the effects are mixed: men with a higher probability to find a partner are more likely to seek medical help but are less likely to do sports regularly and to follow a healthy diet.

Table 2.4: Coefficients of inverse Mills ratio

Health indicator	Males		Women	
Doctor visit	0.023*	(0.014)	0.028**	(0.013)
Weekly sport	-0.035**	(0.018)	0.054***	(0.016)
Healthy diet	-0.050*	(0.030)	-0.020	(0.030)

1) Bootstrapped standard errors in parentheses.
2) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Since there might be differences in the spousal impact depending on the length of marriage we also ran the estimations on two subsamples: first, the marriage has lasted up to ten years at time t and second, it has lasted more than ten years. Unfortunately, we have to drop cohabiting spouses in this case since we have only information on the duration of marriage, not of cohabitation. While the point estimates differ between both subsamples, confidence intervals highly overlap, probably due to increased standard errors because of smaller sample sizes. Hence, we conclude that testing how the duration of marriage affects our results would be interesting but is not feasible given our data base at the moment.

2.5 Conclusion

Family health production models predict that spouses invest in each other's health since they care about each other and depend economically on each other. Hazardous behavior leads to a reduction in the family's income and, therefore, all family members have an incentive to keep each other in good health, in particular the breadwinner's status. These monitoring efforts can also explain a phenomenon that is widely acknowledged but not yet fully understood in the literature, namely that married individuals are healthier and live longer than unmarried people.

Using a large German household panel data set we analyze whether the partner's health activities have any direct effect on own health behavior. We use the spouse's health behavior as proxy for encouragement and control efforts. As health indicators, we define the decision to see the doctor within a period of three months, to do sports at least once week, and to follow a health-conscious diet. For all three measures we find a high inter-spousal correlation. However, assortative mating and the shared environment could also explain these patterns. Moreover, there might be selection into a relationship that is connected with health behavior which in turn would bias the results. Therefore, we estimate a simultaneous equations model with individual fixed effects and further control for a selection bias by including inverse Mills ratios.

In fact, assortative mating matters in all cases, and even fully accounts for the observed correlation in eating habits. However, regarding physical activity we also find a strong direct effect of the partner's behavior for both sexes. Men and women induce each other to take exercise. Concerning doctor visits, we find gender-specific differences. While the observed correlation in the women's behavior can be fully attributed to assortative mating and the shared environment, women have a positive influence on the men's behavior. Given that a typical

German household still consists of a male principal earner, our results are in line with theoretical predictions where breadwinners seem to benefit more.

2.6 Appendix

2.6.1 Descriptive statistics

Table 2.5: Sample means of control variables

	Men	Women
Private insurance	0.157	0.094
Age $\leq$ 25	0.018	0.042
26 $\leq$ Age $\leq$ 35	0.155	0.185
36 $\leq$ Age $\leq$ 45	0.240	0.251
46 $\leq$ Age $\leq$ 55	0.210	0.213
56 $\leq$ Age $\leq$ 65	0.198	0.176
66 $\leq$ Age $\leq$ 75	0.133	0.106
Degree of handicap	8.025	5.266
Foreign	0.099	0.096
Children in household	0.379	0.379
West	0.748	0.748
Full-time	0.637	0.257
Part-time	0.016	0.210
Unemployed	0.065	0.066
Blue-collar	0.266	0.115
White-collar	0.252	0.330
Self-employed	0.089	0.045
Log. equiv. HH-income	7.269	7.269
Health job	0.015	0.058
Years of education	12.190	11.707
SAH very good	0.074	0.072
SAH good	0.411	0.407
SAH bad	0.128	0.141
SAH very bad	0.035	0.032
Hospital visit last year	0.109	0.134
Year = 1996	0.051	0.051
Year = 1997	0.050	0.050
Year = 1998	0.054	0.054
Year = 1999	0.054	0.054
Year = 2000	0.093	0.093
Year = 2001	0.084	0.084
Year = 2002	0.091	0.091
Year = 2003	0.085	0.085
Year = 2004	0.081	0.081
Year = 2005	0.077	0.077
Year = 2006	0.082	0.082
Year = 2007	0.076	0.076
Year = 2008	0.071	0.071
Observations	85,791	85,791

Means are exemplarily taken from the doctor visits-sample.
SAH=self-rated health status

2.6.2 Full estimation results

Table 2.6: Coefficients of men's doctor visits

	OLS		FE		FE-SEM		FE-SEM Sel.	
Doctor visit sp.	0.16***	(0.01)	0.10***	(0.00)	0.07**	(0.03)	0.06**	(0.03)
Private insur.	-0.04***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)	-0.03**	(0.01)
Age $\leq$ 25	-0.10***	(0.02)	0.02	(0.03)	0.02	(0.03)	0.02	(0.03)
26 $\leq$ Age $\leq$ 35	-0.11***	(0.01)	-0.02	(0.03)	-0.03	(0.03)	-0.03	(0.02)
36 $\leq$ Age $\leq$ 45	-0.12***	(0.01)	-0.05**	(0.02)	-0.05**	(0.02)	-0.05**	(0.02)
46 $\leq$ Age $\leq$ 55	-0.10***	(0.01)	-0.06***	(0.02)	-0.06***	(0.02)	-0.06***	(0.02)
56 $\leq$ Age $\leq$ 65	-0.04***	(0.01)	-0.03*	(0.02)	-0.03*	(0.02)	-0.03**	(0.01)
66 $\leq$ Age $\leq$ 75	-0.00	(0.01)	-0.01	(0.01)	-0.02	(0.01)	-0.02	(0.01)
Deg. of handicap	0.00***	(0.00)	0.00***	(0.00)	0.00***	(0.00)	0.00***	(0.00)
Foreign	0.01	(0.01)	-0.02	(0.02)	-0.02	(0.02)	-0.02	(0.03)
Kids in HH	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)
West	-0.02***	(0.01)	-0.06**	(0.03)	-0.06**	(0.03)	-0.06	(0.04)
Full Time	0.00	(0.01)	0.00	(0.01)	0.00	(0.01)	0.00	(0.01)
Part Time	0.03	(0.02)	-0.01	(0.02)	-0.01	(0.02)	-0.01	(0.02)
Unemployed	-0.04***	(0.01)	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)
Blue collar	-0.07***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)
White Collar	-0.05***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)
Self-employed	-0.13***	(0.01)	-0.10***	(0.01)	-0.11***	(0.01)	-0.11***	(0.02)
Log. eq. HH-inc.	0.05***	(0.01)	0.01**	(0.01)	0.01**	(0.01)	0.01**	(0.01)
Health Job	-0.10***	(0.02)	0.05	(0.03)	0.05	(0.03)	0.05	(0.04)
Years of educ.	0.01***	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
SAH very good	-0.28***	(0.01)	-0.21***	(0.01)	-0.21***	(0.01)	-0.21***	(0.01)
SAH good	-0.14***	(0.01)	-0.11***	(0.00)	-0.11***	(0.00)	-0.11***	(0.01)
SAH bad	0.12***	(0.01)	0.11***	(0.01)	0.11***	(0.01)	0.11***	(0.01)
SAH very bad	0.11***	(0.01)	0.12***	(0.01)	0.12***	(0.01)	0.12***	(0.01)
Hosp. visits	0.12***	(0.00)	0.08***	(0.01)	0.08***	(0.01)	0.08***	(0.01)
Inv. Mills							0.02*	(0.01)
Constant	0.29***	(0.04)	0.58***	(0.06)	0.61***	(0.07)	0.06	(0.06)
Year dummies	yes		yes		yes		yes	
Observations	85,791		85,791		85,791		118,768	

1) Standard errors in parentheses; bootstrapped standard errors in selection models.
2) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
3) SAH=self-rated health status.

Table 2.7: Coefficients of women's doctor visits

	OLS		FE		FE-SEM		FE-SEM Sel.	
Doctor visit sp.	0.13***	(0.00)	0.08***	(0.00)	-0.03	(0.02)	-0.03	(0.02)
Private insur.	-0.02**	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)
Age $\leq$ 25	0.00	(0.01)	-0.00	(0.03)	-0.00	(0.03)	-0.00	(0.03)
26 $\leq$ Age $\leq$ 35	-0.02	(0.01)	-0.03	(0.03)	-0.04	(0.03)	-0.04*	(0.02)
36 $\leq$ Age $\leq$ 45	-0.06***	(0.01)	-0.06***	(0.02)	-0.07***	(0.02)	-0.07***	(0.02)
46 $\leq$ Age $\leq$ 55	-0.07***	(0.01)	-0.07***	(0.02)	-0.07***	(0.02)	-0.08***	(0.02)
56 $\leq$ Age $\leq$ 65	-0.04***	(0.01)	-0.03*	(0.02)	-0.04**	(0.02)	-0.04***	(0.01)
66 $\leq$ Age $\leq$ 75	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)
Deg. of handicap	0.00***	(0.00)	0.00***	(0.00)	0.00***	(0.00)	0.00***	(0.00)
Foreign	0.04***	(0.01)	0.04*	(0.02)	0.04*	(0.02)	0.04	(0.03)
Kids in HH	-0.01	(0.01)	-0.00	(0.01)	-0.00	(0.01)	-0.00	(0.01)
West	-0.03***	(0.01)	0.06**	(0.03)	0.06**	(0.03)	0.06*	(0.03)
Full Time	-0.02***	(0.01)	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)
Part Time	0.01	(0.01)	0.00	(0.01)	0.00	(0.01)	0.00	(0.01)
Unemployed	-0.03***	(0.01)	-0.00	(0.01)	-0.01	(0.01)	-0.01	(0.01)
Blue collar	-0.05***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)
White Collar	-0.00	(0.01)	-0.02**	(0.01)	-0.02**	(0.01)	-0.02**	(0.01)
Self-employed	-0.06***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)	-0.04**	(0.01)
Log. eq. HH-inc.	0.06***	(0.01)	0.01*	(0.01)	0.01*	(0.01)	0.01	(0.01)
Health Job	-0.04***	(0.01)	-0.00	(0.01)	-0.00	(0.01)	-0.00	(0.01)
Years of educ.	0.01***	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
SAH very good	-0.22***	(0.01)	-0.16***	(0.01)	-0.17***	(0.01)	-0.17***	(0.01)
SAH good	-0.12***	(0.00)	-0.09***	(0.00)	-0.09***	(0.00)	-0.09***	(0.00)
SAH bad	0.10***	(0.00)	0.07***	(0.01)	0.07***	(0.01)	0.07***	(0.00)
SAH very bad	0.10***	(0.01)	0.10***	(0.01)	0.10***	(0.01)	0.10***	(0.01)
Hosp. visits	0.08***	(0.00)	0.04***	(0.00)	0.05***	(0.00)	0.05***	(0.00)
Inv. Mills							0.03**	(0.01)
Constant	0.31***	(0.04)	0.67***	(0.06)	0.75***	(0.06)	0.00	(0.08)
Year dummies	yes		yes		yes		yes	
Observations	85,791		85,791		85,791		127,108	

1) Standard errors in parentheses; bootstrapped standard errors in selection models.
2) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
3) SAH=self-rated health status.

Table 2.8: Coefficients of men's doing weekly sport

	OLS		FE		FE-SEM		FE-SEM Sel.	
Weekly sport sp.	0.31***	(0.01)	0.19***	(0.00)	0.20**	(0.09)	0.20*	(0.10)
Private insur.	0.02**	(0.01)	0.03***	(0.01)	0.03***	(0.01)	0.03**	(0.01)
Age $\leq$ 25	0.24***	(0.02)	-0.02	(0.03)	-0.02	(0.03)	-0.02	(0.03)
26 $\leq$ Age $\leq$ 35	0.17***	(0.02)	-0.04	(0.03)	-0.04	(0.03)	-0.04	(0.03)
36 $\leq$ Age $\leq$ 45	0.15***	(0.01)	-0.03	(0.02)	-0.03	(0.02)	-0.03	(0.02)
46 $\leq$ Age $\leq$ 55	0.10***	(0.01)	-0.03	(0.02)	-0.03	(0.02)	-0.03	(0.02)
56 $\leq$ Age $\leq$ 65	0.08***	(0.01)	-0.03*	(0.02)	-0.03*	(0.02)	-0.03*	(0.02)
66 $\leq$ Age $\leq$ 75	0.06***	(0.01)	-0.00	(0.01)	-0.00	(0.01)	-0.00	(0.01)
Deg. of handicap	-0.00	(0.00)	-0.00***	(0.00)	-0.00***	(0.00)	-0.00***	(0.00)
Foreign	-0.01	(0.01)	0.06**	(0.02)	0.05**	(0.02)	0.05*	(0.03)
Kids in HH	-0.02***	(0.01)	-0.02***	(0.01)	-0.02**	(0.01)	-0.02**	(0.01)
West	0.05***	(0.01)	0.03	(0.03)	0.03	(0.03)	0.03	(0.04)
Full Time	0.04**	(0.01)	-0.05***	(0.01)	-0.05***	(0.01)	-0.05***	(0.01)
Part Time	0.08***	(0.02)	-0.04**	(0.02)	-0.04**	(0.02)	-0.04**	(0.02)
Unemployed	-0.04***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)
Blue collar	-0.11***	(0.01)	0.00	(0.01)	0.00	(0.01)	0.00	(0.01)
White Collar	-0.07***	(0.01)	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)
Self-employed	-0.12***	(0.02)	-0.02	(0.01)	-0.02	(0.01)	-0.02	(0.02)
Log. eq. HH-inc.	0.06***	(0.01)	0.01*	(0.01)	0.01	(0.01)	0.01	(0.01)
Health Job	-0.03	(0.03)	0.05	(0.03)	0.05	(0.03)	0.05	(0.05)
Years of educ.	0.02***	(0.00)	-0.00	(0.00)	-0.00	(0.00)	-0.00	(0.00)
SAH very good	0.10***	(0.01)	0.04***	(0.01)	0.04***	(0.01)	0.04***	(0.01)
SAH good	0.04***	(0.01)	0.01***	(0.00)	0.01***	(0.00)	0.01***	(0.00)
SAH bad	-0.05***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)
SAH very bad	-0.09***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)
Hosp. visits	0.02***	(0.01)	0.01**	(0.01)	0.01**	(0.01)	0.01**	(0.01)
Inv. Mills							-0.04**	(0.03)
Constant	-0.53***	(0.05)	0.20***	(0.06)	0.20***	(0.06)	-0.53***	(0.08)
Year dummies	yes		yes		yes		yes	
Observations	55,334		55,334		55,334		118,768	

1) Standard errors in parentheses; bootstrapped standard errors in selection models.
2) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
3) SAH=self-rated health status.

Table 2.9: Coefficients of women's doing weekly sport

	OLS		FE		FE-SEM		FE-SEM Sel.	
Weekly sport sp.	0.31***	(0.01)	0.21***	(0.01)	0.35***	(0.07)	0.34***	(0.08)
Private insur.	0.03**	(0.01)	0.03**	(0.01)	0.03*	(0.01)	0.03	(0.02)
Age $\leq$ 25	0.09***	(0.02)	0.07**	(0.03)	0.07**	(0.03)	0.07**	(0.03)
26 $\leq$ Age $\leq$ 35	0.12***	(0.02)	0.06**	(0.03)	0.06**	(0.03)	0.06**	(0.03)
36 $\leq$ Age $\leq$ 45	0.15***	(0.01)	0.08***	(0.03)	0.08***	(0.03)	0.08***	(0.03)
46 $\leq$ Age $\leq$ 55	0.13***	(0.01)	0.08***	(0.02)	0.08***	(0.02)	0.08***	(0.02)
56 $\leq$ Age $\leq$ 65	0.13***	(0.01)	0.08***	(0.02)	0.08***	(0.02)	0.08***	(0.02)
66 $\leq$ Age $\leq$ 75	0.09***	(0.01)	0.07***	(0.02)	0.07***	(0.02)	0.07***	(0.02)
Deg. of handicap	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Foreign	-0.10***	(0.01)	0.03	(0.02)	0.02	(0.02)	0.02	(0.02)
Kids in HH	-0.03***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)
West	0.07***	(0.01)	0.08***	(0.03)	0.08***	(0.03)	0.08**	(0.04)
Full Time	-0.09***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)
Part Time	-0.04***	(0.01)	-0.02**	(0.01)	-0.02**	(0.01)	-0.02*	(0.01)
Unemployed	-0.02***	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)
Blue collar	0.00	(0.01)	0.02**	(0.01)	0.02*	(0.01)	0.02	(0.01)
White Collar	0.07***	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)
Self.employed	0.05***	(0.02)	-0.00	(0.01)	-0.00	(0.01)	-0.00	(0.02)
Log. eq. HH-inc.	0.09***	(0.01)	0.02***	(0.01)	0.02***	(0.01)	0.02***	(0.01)
Health Job	-0.00	(0.01)	-0.00	(0.01)	0.00	(0.01)	0.00	(0.02)
Years of educ.	0.02***	(0.00)	0.01	(0.00)	0.01*	(0.00)	0.01	(0.00)
SAH very good	0.09***	(0.01)	0.03***	(0.01)	0.03***	(0.01)	0.03***	(0.01)
SAH good	0.04***	(0.01)	0.01***	(0.00)	0.01***	(0.00)	0.01***	(0.00)
SAH bad	-0.03***	(0.01)	-0.01**	(0.01)	-0.01*	(0.01)	-0.01*	(0.01)
SAH very bad	-0.07***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)
Hosp. visits	-0.01	(0.01)	-0.01	(0.01)	-0.00	(0.01)	-0.00	(0.01)
Inv. Mills							0.05***	(0.02)
Constant	-0.80***	(0.05)	-0.14**	(0.07)	-0.18**	(0.07)	-1.04***	(0.10)
Year dummies	yes		yes		yes		yes	
Observations	55,334		55,334		55,334		127,108	

1) Standard errors in parentheses; bootstrapped standard errors in selection models.
2) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
3) SAH=self-rated health status.

Table 2.10: Coefficients of men's following healthy diet

	OLS		FE		FE-SEM		FE-SEM Sel.	
Healthy diet sp.	0.37***	(0.01)	0.26***	(0.01)	0.20	(0.16)	0.19	(0.15)
Private insur.	0.02*	(0.01)	0.01	(0.03)	0.01	(0.03)	0.01	(0.03)
Age $\leq$ 25	-0.27***	(0.03)	0.08	(0.08)	0.08	(0.08)	0.08	(0.08)
26 $\leq$ Age $\leq$ 35	-0.22***	(0.02)	0.07	(0.06)	0.06	(0.06)	0.06	(0.06)
36 $\leq$ Age $\leq$ 45	-0.18***	(0.02)	0.07	(0.05)	0.07	(0.05)	0.07	(0.05)
46 $\leq$ Age $\leq$ 55	-0.16***	(0.02)	0.08*	(0.04)	0.08*	(0.04)	0.08*	(0.05)
56 $\leq$ Age $\leq$ 65	-0.09***	(0.02)	0.08**	(0.04)	0.08**	(0.04)	0.08**	(0.04)
66 $\leq$ Age $\leq$ 75	-0.04**	(0.02)	0.08***	(0.03)	0.08***	(0.03)	0.08**	(0.03)
Deg. of handicap	0.00***	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Foreign	0.04***	(0.02)	-0.05	(0.07)	-0.04	(0.07)	-0.04	(0.07)
Kids in HH	0.01	(0.01)	0.02	(0.02)	0.014	(0.02)	0.01	(0.02)
West	0.01	(0.01)	0.08	(0.09)	0.08	(0.09)	0.08	(0.08)
Full Time	-0.07***	(0.02)	-0.06**	(0.03)	-0.06**	(0.03)	-0.06**	(0.03)
Part Time	-0.01	(0.03)	-0.02	(0.04)	-0.03	(0.04)	-0.03	(0.04)
Unemployed	-0.06***	(0.02)	-0.01	(0.02)	-0.01	(0.02)	-0.01	(0.02)
Blue collar	-0.02	(0.02)	0.00	(0.03)	-0.00	(0.03)	-0.00	(0.03)
White Collar	-0.02	(0.02)	-0.01	(0.03)	-0.00	(0.03)	-0.00	(0.03)
Self-employed	-0.01	(0.02)	0.06*	(0.03)	0.06*	(0.03)	0.06*	(0.03)
Log eq. HH-inc.	-0.00	(0.01)	-0.02	(0.02)	-0.023	(0.02)	-0.02	(0.02)
Health Job	-0.02	(0.03)	0.09	(0.08)	0.09	(0.08)	0.09	(0.08)
Years of educ.	0.01***	(0.00)	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)
SAH very good	0.14***	(0.02)	0.06***	(0.02)	0.06***	(0.02)	0.06***	(0.02)
SAH good	0.05***	(0.01)	0.02**	(0.01)	0.02**	(0.01)	0.02**	(0.01)
SAH bad	0.03**	(0.01)	0.04***	(0.01)	0.04***	(0.01)	0.04***	(0.01)
SAH very bad	0.09***	(0.02)	0.11***	(0.02)	0.11***	(0.03)	0.11***	(0.03)
Hosp. visits	0.03***	(0.01)	0.03***	(0.01)	0.03***	(0.01)	0.03***	(0.01)
Inv. Mills							-0.05*	(0.03)
Constant	0.23***	(0.07)	0.39*	(0.20)	0.43*	(0.23)	0.31***	(0.09)
Year dummies	yes		yes		yes		yes	
Observations	20,091		20,091		20,091		118,768	

1) Standard errors in parentheses; bootstrapped standard errors in selection models.
2) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
3) SAH=self-rated health status.

Table 2.11: Coefficients of women's following healthy diet

	OLS		FE		FE-SEM		FE-SEM Sel.	
Healthy diet sp.	0.37***	(0.01)	0.26***	(0.01)	0.16	(0.12)	0.16	(0.12)
Private insur.	0.01	(0.01)	0.08**	(0.03)	0.09**	(0.04)	0.09***	(0.03)
Age $\leq$ 25	-0.09***	(0.03)	0.04	(0.07)	0.05	(0.07)	0.05	(0.07)
26 $\leq$ Age $\leq$ 35	-0.05**	(0.02)	0.04	(0.06)	0.05	(0.06)	0.05	(0.06)
36 $\leq$ Age $\leq$ 45	-0.03	(0.02)	0.08	(0.05)	0.08	(0.05)	0.08*	(0.05)
46 $\leq$ Age $\leq$ 55	-0.00	(0.02)	0.04	(0.05)	0.05	(0.05)	0.05	(0.05)
56 $\leq$ Age $\leq$ 65	-0.00	(0.02)	0.03	(0.04)	0.04	(0.04)	0.04	(0.04)
66 $\leq$ Age $\leq$ 75	0.01	(0.02)	0.01	(0.04)	0.02	(0.04)	0.02	(0.04)
Deg. of handicap	0.00***	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Foreign	-0.04**	(0.02)	0.08	(0.07)	0.08	(0.07)	0.08	(0.07)
Kids in HH	0.03**	(0.01)	-0.02	(0.02)	-0.02	(0.02)	-0.02	(0.02)
West	-0.00	(0.01)	0.09	(0.09)	0.10	(0.09)	0.10	(0.10)
Full Time	-0.09***	(0.01)	-0.03	(0.02)	-0.03	(0.02)	-0.03	(0.02)
Part Time	-0.03**	(0.01)	-0.02	(0.02)	-0.02	(0.02)	-0.02	(0.02)
Unemployed	-0.06***	(0.02)	0.02	(0.02)	0.02	(0.02)	0.02	(0.02)
Blue collar	-0.04***	(0.02)	-0.01	(0.02)	-0.01	(0.02)	-0.01	(0.03)
White Collar	0.01	(0.01)	0.01	(0.02)	0.00	(0.02)	0.01	(0.02)
Self-employed	0.06***	(0.02)	-0.03	(0.03)	-0.02	(0.03)	-0.02	(0.03)
Log. eq. HH-inc.	0.05***	(0.01)	0.01	(0.02)	0.01	(0.02)	0.01	(0.02)
Health Job	0.05***	(0.02)	0.02	(0.03)	0.02	(0.03)	0.02	(0.04)
Years of educ.	0.02***	(0.00)	0.00	(0.01)	0.00	(0.01)	0.00	(0.01)
SAH very good	0.100***	(0.01)	0.06***	(0.02)	0.06***	(0.02)	0.06***	(0.02)
SAH good	0.05***	(0.01)	0.02*	(0.01)	0.02**	(0.01)	0.02*	(0.01)
SAH bad	0.02*	(0.01)	0.03**	(0.01)	0.02*	(0.01)	0.02*	(0.01)
SAH very bad	0.03	(0.02)	0.04*	(0.03)	0.04	(0.03)	0.04	(0.03)
Hosp. visits	0.00	(0.01)	0.00	(0.01)	0.00	(0.01)	0.00	(0.01)
Inv. Mills							-0.02	(0.03)
Constant	-0.13**	(0.07)	0.29	(0.21)	0.36	(0.23)	-0.07	(0.14)
Year dummies	yes		yes		yes		yes	
Observations	20,091		20,091		20,091		127,108	

1) Standard errors in parentheses; bootstrapped standard errors in selection models.
2) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
3) SAH=self-rated health status.

Chapter 3

The spousal impact on labor force behavior: new evidence for older married couples in Germany

3.1 Introduction

The public pension system in Germany causes a steady public debate. Dealing with the demographic change in social security systems is one of the greatest policy challenges in most developed economies. Consequently, knowing more about the determinants of the retirement decision is of high importance given the permanent decrease in labor force participation of men in the 1980s and particularly the 1990s which could not be compensated by the increase of women's. Table 3.1 shows that the employment rates of men older than 54 decreased substantially in the 1990s. In the age group 60–64, even less than 27 % were in employment. However, in the last ten years, an increase could be observed so that the employment rates in 2008 were even higher than at the beginning of the 1990s: they increased from 66.1 % in 2000 to 76.7 % in 2008 in the age group 55-59, and from 27.2 % to 43.3 % for men aged 60 to 64. In contrast, the employment rate of men aged 50 to 54 decreased from 89.5 % in 1991 to 80.9 % in 2005. Only recently, this ratio rose again to 84.8 %. One reason for this rise in recent years is probably the increase in statutory retirement ages in the public pension system and the introduction of benefits adjustments in case of early retirement.

Table 3.1: Employment rates of older men and women in Germany

	Age 50-54		Age 55-59		Age 60-64	
Year	Men	Women	Men	Women	Men	Women
1991	89.5	60.3	73.1	37.8	31.3	9.9
1995	85.6	60.4	64.4	40.0	26.7	9.9
1997	82.8	60.3	62.9	43.2	26.8	10.8
2000	83.8	64.7	66.1	46.6	27.2	12.1
2002	82.3	67.0	68.6	50.1	30.2	14.5
2005	80.9	69.8	71.5	55.3	35.9	20.7
2008	84.8	74.1	76.7	61.4	43.3	27.3

Source: Eurostat (2009)

The labor force participation of German women has increased substantially in the last decades - as in most developed countries. This rise is not restricted to the young but women of all ages display this change in behavior. For example, about 60 % of women aged 50–54 were employed in the beginning of the 1990s, whereas the employment rate increased to 74.1 % in 2008. The employment rate of women aged 60 to 64 almost tripled from 1995 to 2008.[1]

[1] Nevertheless, one has to bear in mind that women often work part-time in contrast to men.

A consequence of the rise in female labor force participation is the increasing proportion of dual-worker couples among families approaching retirement. Hence, learning more about the interdependencies between the spouses' retirement decisions becomes increasingly important. How do certain characteristics of the spouse influence the individual decision to leave or to enter the labor force? In particular, does the employment status of one spouse affect the retirement behavior of the other spouse? Since spouses usually share resources and care about each other to some degree, they probably face a different optimization problem than a single person. Moreover, they may have a preference to spend leisure time together and therefore, try to coordinate their working behavior. Concerning the individual retirement decision of men, there exists already a fair amount of studies, whereas the literature on female and couples' retirement behavior is less developed. Nevertheless, in the last 15 to 20 years, some economists and sociologists have started to analyze the working behavior of elderly couples taking into account these interdependencies. They usually find that the household context plays a role and that spouses seem to have a preference to spend their spare time together (see e.g. Gustman and Steinmeier, 2002; Blau, 1998). However, for Germany, only a few studies exist providing evidence for cross-spouse effects and differences between dual-worker and male breadwinner-couples (see e.g. Allmendinger, 1990; Drobnič and Schneider, 2000; Drobnič, 2003). However, they often use cross-sectional data or restrict their analysis to wife's impact on the husband's decision.
Blau and Riphahn (1999) use the SOEP and estimate transition probabilities for four discrete labor force states that depend on the employment states of the two spouses. They use data of older married West German couples from 1984 to 1994. Their analysis of employment exit and entry behavior reveals strong patterns of dependence in the labor force behavior of spouses.

Blau and Riphahn (1999) provide the basis of the present chapter. We use monthly data provided by the SOEP for the years 1996–2007 and follow their approach to estimate probabilities of status changes. Thus, we use recent data for reunified Germany to analyze whether these patterns of dependence in spouses' labor force behavior still hold despite of past reforms in statutory retirement ages. In addition to an extensive set of financial, health, and occupational variables, satisfaction with leisure time is included to see whether and how this affects the working decision. Our findings are in line with previous results: the household context plays a decisive role in the employment decision, and in particular, the employment status of the partner seems to affect the labor force decision beyond the financial aspects. Even after controlling for age, wage, health status etc., the probability of one spouse to stop working is much higher if the other spouse is

already out of employment than if he/she is still employed. There seems to be a preference to share one's retirement. Concerning the probability of going into employment, we find gender-specific differences. For women, the probability to enter is higher if the husband is also employed which is analogous to the findings for women's exit behavior. However, for men, we see the contrary: their probability to start working is higher if she is not employed. Maybe in these cases, the need of a breadwinner dominates all other influences on the working decision. In addition, we find evidence for cross-spouse effects, in particular for husbands. Their probability to leave employment is significantly affected by the wife's wage and benefits. The spouse's health status is another factor that alters the working decision for both, men and women.
In a second step, we modify the general setting of Blau and Riphahn (1999) and further differentiate between unemployment and retirement. We show that the probability to retire is substantially higher if the spouse is also retired compared to a situation in which the spouse is still employed. This supports the interpretation that spouses prefer to retire together. In contrast, the husband's probability to become unemployed does not seem to depend on the wife's labor force status. However, the wife's probability is higher if her husband is still employed instead of being retired.

The Chapter proceeds as follows. Section 3.2 contains a short review of the relevant previous retirement literature and information about the public pension system in Germany. In Section 3.3, the empirical approach and the data are described. In Sections 3.4 and 3.5, empirical results of the basic and the modified model are presented. A conclusion is provided in Section 3.6.

3.2 Background

3.2.1 Previous literature

The German and the international literature on the individual's retirement decision is quite extensive. The basic idea of a typical theoretical retirement model is that each worker chooses the best retirement date by comparing the expected present value of future utilities. Due to the rather small percentage of working women in the past, the vast majority of studies analyze only men's retirement behavior. The models usually assume that man's utility depend on his market wage, the accumulation of private pension assets or social security wealth, and the value of leisure. Empirical studies usually find large and significant effects of financial incentives resulting from the social security system and from private

pension plans.[2] Any impact of the working behavior or attributes of the wife and the family have been widely ignored in both, theoretical modeling and empirical studies (see Lundberg, 1999). At least for the empirical literature, the reason is usually the poor data availability of the wife's corresponding characteristics.
Because of the increase in the labor force participation rates of women, a few studies emerged in the 1980s and early 1990s examining the individual retirement decision of older women. Usually, these studies include household's or husband's characteristics, however, they are usually assumed to be exogenous. Their findings are mixed. For example, McCarty (1990) and Vistnes (1994) find evidence that married women respond to a change in the one-year social security accrual. In contrast, results from Pozzebon and Mitchell (1989) suggest that family considerations are more important, while own earnings opportunities have no impact.[3]

However, it is very likely that the working decisions of elderly spouses are interdependent and therefore, analyses of the retirement behavior of married individuals should take into account the spouse's situation. There are several possible sources for interdependencies (see Hurd, 1990). First, spouses usually share financial resources like income and assets. Moreover, the income tax system in Germany regulates that the tax burden of one spouse is affected by the income of the partner. Another reason for a correlation in the spouses' working behavior can be assortative mating, i.e. men tend to marry women (and vice versa) who have similar abilities and preferences, in this case concerning retiring. A third source is the complementarity of leisure, which means that spouses may prefer to spend leisure time together. If so, the utility of own leisure increases if it is spent with the partner.
Therefore, despite of data limitations in the beginning, some economists and sociologists have started to focus on the joint retirement decision of a couple. Even though all of the following studies are based on different data sets using different estimation methods, their findings confirm that retirement decisions are made within the context of the family. A considerable fraction of husbands and wives seems to coordinate their labor supply at older ages. Moreover, this coordination seems to originate from complementarity of leisure and assortative mating.
Most studies use reduced form techniques to examine cross-spouse effects of economic, health and other variables. For example, Hurd (1990) was the first who finds coordination of retirement dates by estimating Stone-Geary utility func-

[2]Exemplary for Germany is Börsch-Supan et al. (2004).

[3]However, all studies are based on data sets that are problematic in some respects. For example, married women in the US-Retirement History Survey have not been asked the full range of questions. See Weaver (1994) for a more detailed review of the literature on women's retirement decision.

tions. His results give evidence for complementarity of leisure as the main reason. Only recently, Pozzoli and Ranzani (2009) use data from the Survey of Health, Ageing and Retirement in Europe (SHARE) to analyze the joint retirement of couples in Europe with duration models. They find that joint retirement, i.e. spouses retire within one year, is significantly correlated with own education, age, and health status as well as the partner's employment status, age, and health status.[4] Nevertheless, a few structural bargaining models of couple's retirement behavior have also been developed. Gustman and Steinmeier (2000, 2002) apply a non-cooperative game, whereas, e.g., Maestas (2001), Michaud and Vermeulen (2004), or Jia (2004) develop a cooperative model. These authors typically find that complementarity in leisure plays an important role. Moreover, Jia (2004) shows that wife's leisure is valued more by couples than husband's leisure.
Blau (1997, 1998) uses a unitary framework in order to analyze the joint labor force behavior of older married couples. He estimates transition probabilities among a set of discrete joint labor force states, where one status is defined by the two employment states of husband and wife. He finds a strong association between the transition probabilities of one spouse and the status of the other spouse. He concludes that this is probably due to complementarity of leisure since he has accounted for other factors like assortative mating in his model. Michaud (2003) and Mastrogiacomo et al. (2004) extend Blau's approach but use different data sets. In general, they confirm his results.

For Germany, only a few studies exist. Allmendinger (1990), Wagner (1991), Pischner and Wagner (1992), and Wagner (1996) examine mainly cross-sectional data in order to describe retirement patterns. They provide first evidence for cross-spouse effects and a tendency to retire together. Both Drobnič and Schneider (2000) and Drobnič (2003) use the SOEP in order to examine the retirement timing using a piece-wise constant hazard model. Drobnič and Schneider (2000) estimate the probability to retire for wives and husbands of dual-worker couples separately. They find that husbands' decision is based only on the financial situation of the household, whereas wives also consider the labor force status of the husband and household size. In contrast, Drobnič (2003) looks for differences in the determinants of the retirement decision between unmarried and married men, and between married men with a working and a non-working wife. She concludes that the existence and the labor force status of a wife matters in the men's retirement decision. Namely, unmarried men and husbands with non-employed wives strongly respond to financial incentives, whereas household's economic well-being

[4] Other examples of reduced form estimations are Zweimüller et al. (1996) for Austria, Baker (1999) for Canada, Johnson and Favreault (2001) using the US-HRS data set, or An et al. (2004) for Denmark. Jiménez-Martín et al. (1999) use the European Community Household Panel to describe and analyze couples' retirement patterns for the EU12 countries.

is secondary in the retirement decision of married men with a working wife. Blau and Riphahn (1999) follow Blau's approach, and estimate transition probabilities from one joint labor force state into another. They find that the predicted probability of leaving employment is higher if the spouse is not employed and the probability of entering employment is higher if the partner is employed. Moreover, the spouse's characteristics seem to influence the working decision but not in the same way for men and women.

3.2.2 The public pension system in Germany

The basic structure of today's German public pension system were established in 1957.[5] It is characterized by a pay-as-you-go scheme and a very broad mandatory coverage of workers. In 1992 and 2001, two major reforms were carried out, with additional modifications afterwards. In 1992, adjustments of benefits to early retirement and an increase in statutory retirement ages were introduced. However, the change in statutory ages took place with a long delay starting in 1997, and the adjustments of benefits are not fully actuarial. With the reform of 2001, a multipillar pension system has been introduced that will be fully phased in by 2050. Thus, current retirees' income is still shaped by a monolithic pension system.

The system is mainly financed by contributions that are administered like a payroll tax (up to an upper earnings threshold), levied equally on employees and employers. Around 25 % of the budget are financed by subsidies from the federal government (see Deutsche Rentenversicherung, 2008). There are three types of pensions: old-age pensions, disability benefits, and survivor benefits for spouses and children. Old-age pensions are further differentiated into one "normal" retirement and four opportunities of early retirement. With the exception of survivor benefits, there are no benefits for spouses like in the US. Benefits are strictly work-related. The only special regulation regarding married couples was the introduction of different mandatory retirement ages for men and women in 1957. According to Ehmer (1990), the main motivation for this difference was to enable couples to retire jointly, given the common age difference between husband and wife which amounted to three years at that time. The official reason was to give employed women a bonus for their double burden of market and domestic work. However, with the reform of 1992, this discrimination in the normal retirement age has subsequently been abolished (see Table 3.2).

[5] The following section is based on the more detailed description of the system and reforms by Börsch-Supan and Wilke (2003).

Benefits are computed on a lifetime basis and adjusted according to the type of pension and the retirement age. They are the product of four elements: 1. the so-called earnings points that reflect the employee's earnings position relative to the average German worker in each working year, 2. the years of service life, 3. adjustment factors for pension type and retirement age, and 4. a reference pension value (current pension value). Hence, the level of benefits is strongly influenced by the individual's lifetime earnings history. Redistribution has never been an important factor.

Table 3.2: Pre-1992 and current statutory retirement ages

Type of Old-Age Pension	Age of Retirement (pre-1992 reg.)	Age of Retirement (post-1992 reg.)	Period of phasing in
Normal	65	65	-
Long Service Life (35 years)	63	65	2000–01
Women	60	65	2000–04
Sev. Handicapped	60	63	2001–03
Unemployed	60	65	1997–2001

Table 3.2 shows statutory retirement ages of the five types of old-age pensions with full benefits before and after the implementation of the 1992 reforms. Between 1997 and 2004, the opportunities to go into retirement before age 65 without any adjustments to the benefits were abolished successively. Only to older people with a severe handicap, full benefits are paid as of age 63. Nevertheless, retirement below age 65 is still possible but only at the cost of benefit adjustments. For women and severely handicapped early retirement is possible as of age 60, whereas men with long-term contributions can exit as of age 63. For unemployed the minimum age for early retirement was increased from 60 to 63 between 2006 and 2008.[6] Only recently, further increases in statutory ages have passed the German Bundestag that will be fully phased in 2029. The new law regulates that the normal retirement age is 67. Early retirement without benefit adjustments is only possible as of age 65 for severely handicapped and those with 45 service life years. For disabled individuals, there is no minimum retirement age.

In addition to these official pathways to retirement, many people used to exit the labor force via unemployment. Firms often laid off older workers as many months before age 60 as the worker's unemployment benefits would run. Sometimes they

[6]To qualify for normal and early retirement benefits, certain conditions must be satisfied like minimum years of contribution. For more details, see e.g. Börsch-Supan and Wilke (2003).

offered a severance payment. This quite common scheme of retirement in the 1990s helps to explain the low labor force participation rate among men of age 55–59 during that time.

3.3 Empirical approach

3.3.1 Multinomial logit model

The empirical strategy is to define four discrete states depending on the (self-assessed) labor force states of the two spouses, and to estimate the probabilities to change a given status. Ultimately, we compare the results when the partner is employed with those when the partner is not employed.
The discrete states are defined as follows:

1: Both spouses are employed.

2: The husband is employed, the wife is not employed.

3: The husband is not employed, the wife is employed.

4: Both spouses are not employed.

Hence, at this stage, we only distinguish between employment and non-employment (and not between participation and non-participation). This is a strong simplification because it neglects differences between full-time and part-time workers as well as between unemployed and retired individuals. Moreover, we group individuals searching for a job and those that are not participating, e.g. housewives. In Section 3.5, we further differentiate between unemployment and retirement in order to analyze the exit behavior in more detail. Nevertheless, any further differentiation makes estimation problematic because we do not have enough observations for each possible transition. Therefore, we start our analysis with the general exit and entry behavior out of and into employment, where *exit* denotes to stop working and *entry* to start working.

For our estimations, we make use of the calendars of the SOEP that provide the labor force status in each month of last year. Thus, we use discrete time-data to estimate the monthly transition probabilities from one state into another controlling for various individual factors of the spouses and household characteristics. We apply the multinomial logit model (MNL). By using this approach we avoid a selection of couples based on labor force participation, especially of wives. In many previous empirical studies, e.g. Gustman and Steinmeier (2000), only

couples were chosen where both spouses had a strong labor force attachment. Moreover, we do not include the partner's labor force status as supposedly exogenous regressor (like e.g., Drobnič and Schneider, 2000), which is questionable if spouses coordinate their working decision.
The MNL approach computes the predicted probabilities to observe outcome m of J possible alternatives given a vector of exogenous regressors x by

$$Pr(y = m \mid x) \quad = \quad \frac{\exp(x\beta_{m|b})}{\sum_{j=1}^{J} \exp(x\beta_{j|b})},$$

where b is the base category. We estimate four multinomial logit equations (one for each of the four defined states) separately. In principle, each of the four original states has four possible outcomes in the next period: neither of the spouse changes the employment status, only the husband changes, only the wife does, or both spouses change their status. However, we restrict our analysis to the first three alternatives since we have too few observations in which both spouses change (see Section 3.3.2 for more details).
The MNL model assumes independence of irrelevant alternatives (IIA). Whether this assumption actually holds can be checked with various tests like the Hausman and McFadden (1984) or the Small and Hsiao (1985) test. Whereas the Hausman-McFadden test cannot reject independence in any case, the Small-Hsiao test rejects it in three of eight cases. Even though the tests do not give clear evidence they suggest that the IIA assumption is not problematic. Moreover, McFadden (1974) proposed that the MNL model should only be used if the alternatives were distinct and could be weighed independently by the decision maker (see Long and Freese, 2006, ch. 6). In our opinion, the alternatives to work or not to work, given that the spouse also either works or does not work, are distinct from each other. Therefore, the potential violation of the IIA assumption should not be a problem in our setting.

3.3.2 Sample

In our data set, we make use of the West and East German sample provided by the SOEP. Due to transitory retirement regulations after reunification, we only use data for the years 1996 to 2007. Since we are only interested in the behavior of older couples, the sample is further limited to married couples in which at least one spouse is in the age range from 50 to 65. Observations are censored upon dissolution of marriage, death of one spouse, both spouses being older than 65, or panel attrition. Finally, all observations are censored after 2007. The sample consists of 2,620 couples with 5,013 spells and 2,393 transitions observed for a

total of 133,050 months.

Figures 3.1 and 3.2 describe the employment behavior of men and women in the sample. Figure 3.1 shows the probability of employment by age for husbands and wives, separately. Between husband's age 50–56, the employment rate decreases from 90 % to 80 %, whereas for wives, the rate drops from 74 % to 58 %. They further decrease to 40 % and 17 % at age 61, respectively.[7] At the normal age of retirement for men, age 65, only 9 % of husbands (and 4 % of wives) are still in employment.

Figure 3.1: Probability of labor force participation by age for husbands and wives in the sample

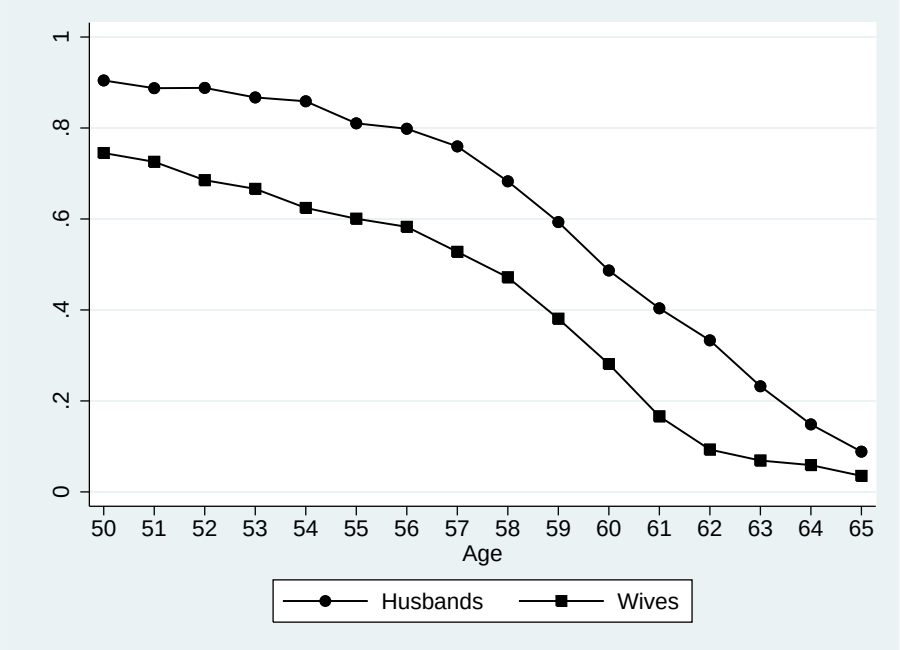
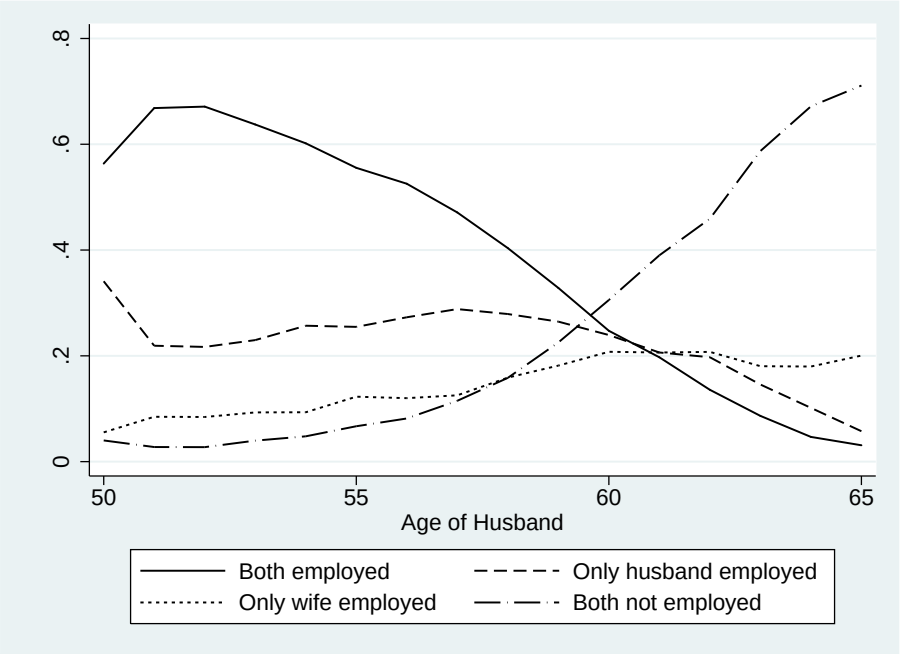


Figure 3.2 describes the distribution of couples' joint labor force states by husband's age. From age 50 to 59, it is most common to observe both spouses working. However, from age 52 onwards the percentage is steadily decreasing from 67 % to 33 %. Already after husband's age 59, the most frequently observed state is state 4, when both spouses are not employed (31 %). The proportion increases to 71 % at age 65. From age 50 to 59, the second largest proportion of couples is in state 2 with a working husband and a non-working wife (22 % to 34 %). In contrast, status 3 is very common when the husband is of age 58 to 65. The proportion increases from 13 % at age 57 to more than 20 %. Compared to the Blau and Riphahn (1999) sample from 1984 to 1994, the incidence of states 3 and 4 is in our sample much higher at younger ages of the husband. From age 50 to 58, the fraction of couples in state 3 was constantly about 5 % in the Blau/Riphahn

[7] 60 was the "normal" age of retirement for women, severely handicapped and unemployed.

Figure 3.2: Distribution of joint labor force states by husbands' age in the sample



sample, whereas we observe a proportion of 5 % to 16 %. Moreover, it had a peak below 20 % at age 62. State 4 was the most frequently observed state only after age 61. Hence, despite of the recently introduced disincentives for early retirement, the probability to observe a couple with a non-working husband who is younger than 60 is higher in the present sample. These findings might be driven by the unemployment rate of East German men that was about twice as high as for West German men over the last 15 years (see Statistisches Bundesamt, 2009c). East German couples were not included in the Blau/Riphahn sample.

Table 3.3: Reclassifications of transition states

Original transition in t	New transition in t–1	New transition in t
$1 \rightarrow 4$	$1 \rightarrow 3$	$3 \rightarrow 4$
$2 \rightarrow 3$	$2 \rightarrow 1$	$1 \rightarrow 3$
$3 \rightarrow 2$	$3 \rightarrow 1$	$1 \rightarrow 2$
$4 \rightarrow 1$	$4 \rightarrow 2$	$2 \rightarrow 1$

Our empirical strategy is to estimate transition probabilities. In our data set, we observe more than 2,300 changes of states in total. However, only 34 involve both spouses changing employment status within one month. Since these numbers of joint transitions are too small for estimation, these cases are reclassified. We follow Blau and Riphahn (1999) and assume that one spouse changes the status

in period $t-1$ and the other one in t. The "first-mover" is assumed to be the one with the higher unconditional transition probability. Table 3.3 shows the reclassification patterns. Since one period is only one month in our setting, this data modification should not be severe.

Table 3.4 displays the unconditional transitions from one state into another after reclassification. Percentages are given in parentheses. There is a high incidence of remaining in the original state (97 % to 99 %), which is not surprising given that we use monthly data. However, these figures provide a first hint for a possible interrelationship between the labor market behavior of two spouses. The average monthly probability that a husband stops working is much higher if the wife is not employed ($2 \rightarrow 4$: 1.21 %) than if she is still working ($1 \rightarrow 3$: 0.75 %). The same holds for wives: the exit probability is much higher if the husband is already out of the labor force ($3 \rightarrow 4$: 1.26 %) than if he is employed ($1 \rightarrow 2$: 0.73 %). Concerning the entry behavior, analogous patterns can be found: the probability of entering the labor market is lower if the partner is not working. However, these numbers do not control for age, financial aspects, health status etc.

Table 3.4: Employment status transitions

State of	Destination State				
Origin	1	2	3	4	Total
1	44,847	332	343	0	45,522
(Both employed)	(98.52)	(0.73)	(0.75)	(0.00)	(100.00)
2	400	25,717	0	319	26,436
(Only H employed)	(1.51)	(97.28)	(0.00)	(1.21)	(100.00)
3	331	0	19,519	253	20,103
(Only W employed)	(1.65)	(0.00)	(97.09)	(1.26)	(100.00)
4	0	235	180	40,574	40,989
(Both OLF)	(0.00)	(0.57)	(0.44)	(98.99)	(100.00)
Total	45,578	26,284	20,042	41,146	133,050
	(34.26)	(19.75)	(15.06)	(30.93)	(100.00)

1) OLF: Out of labor force = unemployed, retired, housewife/-husband;
2) H: Husband, W: Wife;
3) Percentages in parentheses.

Table 3.5 describes the distribution of spells by couples. For the majority of observations (48 %), the couple remain in one spell over the sample period, i.e. they do not change their status. In contrast, for 23 % of all observations, they change their status once, and for 14 % twice.

Table 3.5: Distribution of no. of spells per couple

No. of spells	No. of obs.	Obs. in %
1	63,428	47.67
2	30,799	23.15
3	18,139	13.63
4	8,571	6.44
5	5,791	4.35
6	2,849	2.14
7	937	0.70
8	1,172	0.88
9 to 10	596	0.45
More than 10	768	0.58
Total	133,050	100.00

3.3.3 Explanatory variables

In the MNL estimations, we control for various factors that should affect the decision to start and to stop working. Table 3.6 lists the explanatory variables used in the estimations. We distinguish between individual characteristics and variables on a household level. To allow for cross-spouse effects, individual factors of both mates are included. Descriptive statistics are given in Appendix 3.7.1.

Table 3.6: Explanatory variables

Subject	Individual variables	Var. on HH level
Finances	Predicted wage and benefits	Non-labor income
Health	Handicap	
Occupation	Blue-/white-collar worker, public-/self-employed, tenure, hours worked	
Human capital	Education	
Satisfaction	With leisure time, with job	
Others	Age	No. of persons in HH, spell duration, East, year dummies

Key factors for the working decision are the financial incentives, namely the wage income if the individual is employed and benefits if he/she is not employed. We expect that a higher wage induces an individual to stay in employment or to enter employment. Analogously, higher benefits should increase the exit probability and decrease the entry probability. Since wages are not observable for non-workers, and benefits are not observable for workers, we estimate Heckman selection models for husbands and wives separately. From the resulting estimates

we predict monthly wages and benefits for each observation.[8] Our approach is a simplification, in particular for the benefits, because we do not account for non-linearities in the German public pension system. However, for a more descriptive rather than structural analysis like this, it should be justifiable to use this approach. In addition to predicted wages and benefits of both spouses, we consider the household's net non-labor income.

Two other important determinants of the employment decision are age and health status. The labor force participation usually decreases with age. Similarly, a worsening health status should lead to a lower probability to be in employment, in particular given the opportunity of early retirement for severely handicapped. Consequently, we include a dummy variable whether the individual has a handicap or not as well as the individual's age.[9]

Several authors have suggested that spouses might prefer to spend leisure time together and as a consequence, we would observe interdependencies in their retirement decisions. Unfortunately, we do not know how the couples value the time spent together. Nevertheless, we do know how satisfied somebody is with its own leisure time. In the SOEP, satisfaction is measured on a 11-point scale from 0 (very low) to 10 (very high) which we combine to four dummies: very high (8 to 10), high (5 to 7), low (3 to 4), and very low (0 to 2). These dummies may also capture how important spare time is for the individual and how important it is to share it with the partner. Since the satisfaction with leisure time is to some extent linked with working time, we also include the actual hours worked per week.

Another individual characteristic we control for is education. We follow Blossfeld and Timm (2003) and define three hierarchical education levels: "low" if somebody has no schooling degree, a *Hauptschul-* or *Realschul*-degree but no vocational degree; "medium" if the individual has no schooling degree, a *Hauptschul-* or *Realschul*-degree and additionally a vocational degree or if he/she has *Abitur/Fachhochschulreife*, with or without a vocational degree. "high" means a university degree or a degree from a university of applied sciences.

As there are probably differences between industry sectors, in particular concerning the risk of unemployment, we distinguish between white- and blue-collar workers, between publicly employed (vs. privately) and self-employed. Moreover, we include firm tenure (in years). As subjective measure, we consider satisfaction with the job, ranging from "very high" and "high" to "low" and "very low". Additional controls include the number of individuals living in the household, a quadratic in the duration of the current spell, a dummy variable for couple living

[8] Details about the wage and benefits estimations can be found in Appendix 3.7.2.

[9] The use of dummies with age groups reflecting the thresholds for early retirement does not lead to any improvement.

in East Germany, and year dummies. All covariates are given on an annual basis except the spell duration which is monthly data.

3.4 Results

The unconditional transition probabilities indicate that the labor force status of the spouse affects the labor market behavior. In the following, we first examine the predicted probabilities to stop and to start working from the MNL regressions to see whether this pattern still holds if we control for age, financial variables, health status etc. Because of the large number of results, we restrict the discussion in Section 3.4.2 to a selection of variables. Moreover, we only interpret effects on the probability to stop working. Full estimation results are given in Appendix 3.7.3.

In order to stress the impact of spouse's labor force status, those results are directly compared in which one spouse changes the status, first, if the partner is employed, and second, if the partner is not employed. For example, if the husband leaves employment, marginal effects are compared from transition from state 1 into 3 (wife remains employed) with transition from state 2 into 4 (wife is not employed). Table 3.7 illustrates which transitions we compare.

Table 3.7: Comparison of transitions

	Husband		Wife	
	Wife empl.	Wife OLF	Husb. empl.	Husb. OLF
Exit	$1 \rightarrow 3$	$2 \rightarrow 4$	$1 \rightarrow 2$	$3 \rightarrow 4$
Entry	$3 \rightarrow 1$	$4 \rightarrow 2$	$2 \rightarrow 1$	$4 \rightarrow 3$

OLF: Out of labor force = unemployed, retired, housewife/-husband.

3.4.1 Predicted transition probabilities

Table 3.8 shows the predicted probabilities to stop and to start working based on the MNL regressions. Since the four samples differ in the covariates' distributions, we do not take the means but specify certain values for prediction. Hence, we compare predicted transition probabilities for individuals that only differ in the labor force status of the spouse. Moreover, we assume the same values for husband and wife. The last columns in Tables 3.13, 3.14, and 3.15 in Appendix 3.7.1 present all the values that we assume.

Our results mainly support the hypothesis that married people prefer to be in the same labor force status as the spouse. The exit probability is higher for

Table 3.8: Predicted probabilities

	Husband		Wife	
	Wife empl.	Wife OLF	Husb. empl.	Husb. OLF
Prob. stop working	0.0046	0.0445	0.0478	0.0697
Prob. start working	0.0003	0.0015	0.0067	0.0008

1) OLF: Out of labor force = unemployed, retired, housewife/-husband;
2) Assumed values for covariates are given in Appendix 3.7.1.

both, husbands and wives, if the spouse is already out of employment. Moreover, the wife's probabilities are much higher than the husband's (0.0478 and 0.0697 compared to 0.0046 and 0.0445). Similarly, for wives, the probability to start working is higher if the husband is also employed. However, we do not find this pattern for husband's probability to go into employment. For them, the entry probability is higher if the wife is out of the labor force. Maybe the need to have a breadwinner dominates in these cases.

3.4.2 Impact of selected covariates

Since the estimated coefficients of a multinomial logit model provide little information, we present average marginal effects on the predicted transition probability. The standard errors of them are computed with the delta method. Table 3.9 shows selected marginal effects. Since we estimate monthly transition probabilities the effects are usually quite small. However, relative to the predicted transition probabilities (see Section 3.4.1) the influence of the variables is often quite substantial.

In general, the effects of own wage and benefits are as expected. Higher wages and lower benefits lead to a stronger labor force attachment, where reactions of women are always stronger than of men. Moreover, the size of the effects differs depending on the labor force status of the spouse. The negative effect of own wage on the probability to stop working is always higher if the spouse is still employed, whereas the positive effect of benefits is stronger if the spouse is not employed. For instance, if the wife's own wage increases by 1,000 Euro, her probability to stop working increases by 0.03 percentage points if the husband is employed and by 0.01 if he is not employed. Concerning the financial incentives of the spouse we find gender- and income type-specific differences. The wife's wage reduces the husband's probability to stop working, whereas her benefits increase the likelihood. In contrast, the husband's financial incentives do not have any significant effect on the wife's transition probability. In contrast to intuition, the household's other non-labor income usually decreases the probability to stop working, in particular if the spouse is not employed.

The effect to be handicapped is not as expected. Only wife's handicap raises the risk to leave employment if the husband is employed. In all other cases, the effect is negative and not significant. This pattern might be explained by a stronger protection against dismissal for severely handicapped which probably compensates the positive effect of a bad health status.[10] More strikingly, the spouse's health status has often a huge and significant impact on the behavior of the partner. The motive to care for the spouse apparently plays a role in the own employment decision at older age. However, we find again gender-specific differences. For wives, the bad health status of the husband seems to induce them to leave employment, in particular if he is already out of employment. For husbands, the sign depends on her employment status. If she is, despite of the handicap, still employed his probability to stop working is lower, however, if she is not in employment, his probability is higher.

Table 3.9: Average marginal effects on exit probabilities for selected variables

	Husband		Wife	
Variable	W empl.	W OLF	H empl.	H OLF
Financial aspects				
Own wage	-0.000298**	-0.000105**	-0.001125*	-0.000893**
Own benefits	0.000749	0.002086*	0.004926***	0.007488**
Spouse's wage	-0.002250*	-0.004906***	0.000149	0.000001
Spouse's benefits	0.009852***	0.002646	-0.000374	-0.000650
HH's other income	-0.000281	-0.000520**	0.000140	-0.000459
Health				
Handicap	-0.000503	-0.000715	0.000984***	-0.003854
Spouse has handicap	-0.001969***	0.002709***	0.000252	0.002755***
Leisure satisfaction				
Own leisure sat high	0.000180	0.000841	-0.000058	0.000076
Own leisure sat low	-0.000394	0.001675***	0.000010	-0.000256
Own leisure sat very low	0.001114	0.002071***	-0.000194	0.000079
Other variables	yes	yes	yes	yes
No. of observations	45,522	27,085	45,522	20,103
No. of couples	1,186	872	1,186	678

1) OLF: out of the labor force = not employed; H: husband, W: wife, HH: household;
2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Stand. errors estimated by the delta method.
3) Ref. groups: leisure satisfaction very high.
4) Wage and benefits are given in 1,000 Euro.

The results for own leisure satisfaction do not give clear evidence concerning the effect on labor force behavior. Only husbands' unhappiness seems to induce them to leave employment, but only if the wife is also already out of the labor

[10] An alternative, more technical explanation can be that stating to be handicapped is endogenous to employment transitions and therefore, the MNL regressions are biased.

force. We cannot observe this pattern for wives. Maybe husbands have a stronger preference to spend leisure time together with the wife than vice versa.

3.5 Modification: Distinction between retirement and unemployment

3.5.1 New definition of states

The model of the previous section does not distinguish between unemployment and retirement, or part-time and full-time employment. The main reason is to have more observations for each transition and thus, to have better estimates. However, it is very likely that the determinants of a transition into unemployment or into retirement are different. On the one hand, unemployment is often involuntary. On the other hand, even though it was a common scheme of firms to induce older workers at age 58 or 59 to retire via unemployment or special firm schemes, those individuals probably behave differently than people who go directly into retirement. Therefore, we modify the model and distinguish between unemployment and retirement. Hence, an individual can either stay in employment, become unemployed or retire while his or her spouse is employed, unemployed or retired.[11] Now, the possible states are defined as follows:

1: Both spouses are employed.

5: Husband is employed, wife is retired.

6: Husband is employed, wife is unemployed.

7: Husband is retired, wife is employed.

8: Husband is unemployed, wife is employed.

9: Both spouses are retired.

10: Both spouses are unemployed.

11: Husband is retired, wife is unemployed.

12: Husband is unemployed, wife is retired.

As before, if both spouses change the status in month t, these observations are reclassified such that one spouse changes in $t-1$ and the other in t. Given

[11] Non-participating individuals are included in the group of retirees.

that in some states, there are too few observations to get reasonable estimates, the analysis is restricted to retiring and becoming unemployed provided that the spouse is either employed or retired. Thus, we look at transition probabilities out of state 1, state 5, and state 7 (see Table 3.10).

Table 3.10: Analyzed transitions into retirement

	Husband		Wife	
	W empl.	W ret	H empl.	H ret
Retiring	$1 \rightarrow 7$	$5 \rightarrow 9$	$1 \rightarrow 5$	$7 \rightarrow 9$
Becoming unemployed	$1 \rightarrow 8$	$5 \rightarrow 12$	$1 \rightarrow 6$	$7 \rightarrow 11$

Table 3.21 in Appendix 3.7.5 illustrates the number of observed transitions for these three states. The general estimation strategy remains the same.

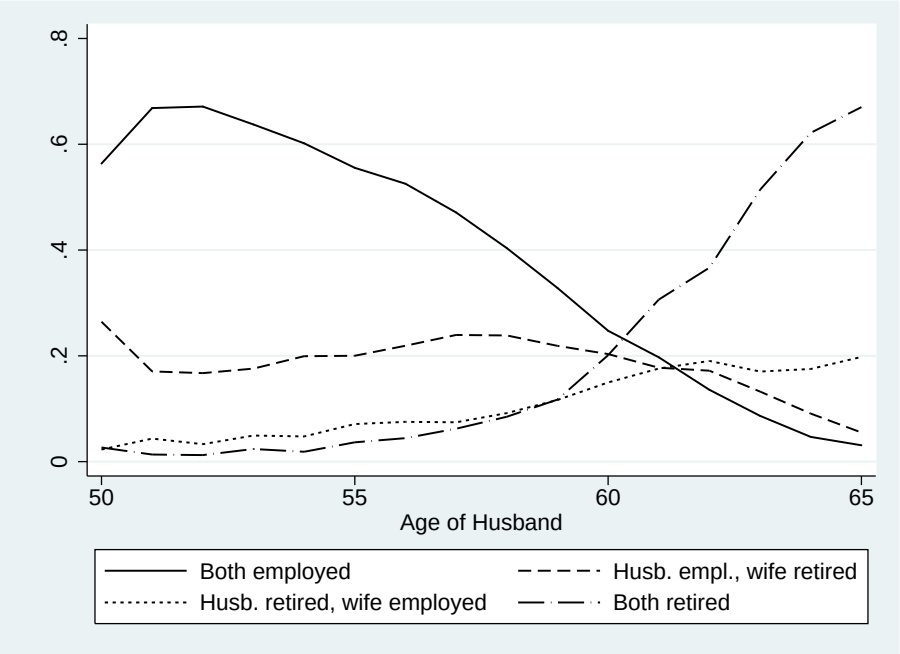
Figure 3.3 shows the distribution of some of the newly defined joint labor force states by husband's age. For the sake of clarity, only the most important four states (1, 5, 7 and 9) are included. It looks very similar to Figure 3.2 which demonstrates that states 5, 7, and 9 are the prevalent ones in the previously defined states 2, 3, and 4. The fractions of states 6, 8, 10, 11, and 12 never exceed 7 %. From age 50 to 60, it is most common to observe state 1 in which both spouses are employed. After age 60, it is most common to observe state 9 in which both spouses are retired. The proportion sharply increases from 20 % at age 60 to 67 % at age 65. The percentage of couples in state 5 (husband employed, wife retired) ranges from 18 % to 26 % between age 50 and 61. After age 61, the proportion decreases from 17 % to 6 % at age 65. The proportion of couples in state 7 (husband retired, wife employed) increases steadily from 7 % at age 57 to 19 % at age 62, and has another peak at age 65 with almost 20 %.

3.5.2 Predicted transition probabilities

Table 3.11 shows the predicted probabilities of retiring and becoming unemployed. We assume the same values for the covariates as in Section 3.4.1. As expected, we find substantial differences between the predicted probabilities of becoming unemployed and of retiring.

Concerning retirement, our previous results are confirmed: the probability to go on pension is higher if the spouse is already retired, indicating again a preference to share one's retirement. Whereas the transition probabilities per se are much higher for wives than for husbands (0.0704 and 0.0866 compared to 0.0010 and 0.1545), the relative difference depending on the spouse's employment status is more pronounced for husbands (0.0010 compared to 0.1545 and 0.0704 compared

Figure 3.3: Parts of the distribution of new joint labor force states by husband's age



to 0.0866). The probability to become unemployed is in each case much smaller than to retire. Nevertheless, the transition probabilities are once more higher for wives than for husbands. Concerning the impact of the spouse's employment status, we also find gender-specific differences. The husband's risk does not seem to be affected by the wife's status, however, for wives the probability is higher if the husband is still employed.

Table 3.11: Predicted probabilities modified model

	Husband		Wife	
	W empl.	W ret	H empl.	H ret
Prob. of retiring	0.0010	0.1545	0.0704	0.0866
Prob. of becoming unemployed	0.0001	0.0001	0.0023	0.0003

Assumed values for covariates are given in Appendix 3.7.1.

3.5.3 Effects of financial incentives

Because of the large number of results Table 3.12 presents only the average marginal effects of the own and the spouse's predicted income on the probability to retire and to become unemployed. Full estimation results are given in Appendix 3.7.6.

Table 3.12: Average marginal effects of financial incentives in modified models

	Husband		Wife	
Variable	W empl.	W ret.	H empl.	H ret.
Retiring				
Own wage	-0.000631*	-0.000745**	-0.000935*	-0.000750*
Own benefits	0.000445	-0.000817	0.003534**	0.000435*
Spouse's wage	-0.000846	0.000617	0.000970***	0.000001
Spouse's benefits	0.001168	-0.001207	-0.000929	-0.001610
Becoming unemployed				
Own wage	-0.001442***	-0.003426***	-0.001932**	-0.003645*
Own benefits	0.001073	0.005163**	0.008519	0.017957***
Spouse's wage	0.000909	0.000058	0.000132	0.000001
Spouse's benefits	-0.002619	0.006247*	0.000340	0.002639*

1) H: husband, W: wife;
2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Stand. errors estimated by the delta method.
3) Wage and benefits are given in 1,000 Euro.

Analogue to the first results, own wage decreases both the probability to retire and to become unemployed, whereas own benefits usually increase them. However, in contrast to the undifferentiated regression results, we now find that the husband's reaction to own financial incentives is stronger if his wife is retired than if she is employed (except own benefits in case of retiring). The same holds for wives in case of becoming unemployed. The probability to retire, however, is stronger affected by changes in own wage and benefits if her husband is still employed. Concerning the spouse's income even the wife's effect on the husband are not significant anymore. This can probably be attributed to the small number of transitions since the impact is often quite substantial although being imprecisely estimated. For instance, in case of retiring, a higher wage of the spouse usually increases the probability, whereas higher benefits usually decrease it. The exception are husbands with an employed wife, for them, it is the opposite. The probability of becoming unemployed is in almost all cases positively affected by a higher income, independent of the type. Thus, the differences in predicted probabilities as well as the effects of different covariates suggest that it is important to distinguish between unemployment and retirement. Moreover, men and women seem to behave differently in some respects. Women react stronger to own financial incentives. Furthermore, the increase in the men's probability due to a change in own wage or benefits is higher if the wife is already retired. However, this only holds for the wife's probability to become unemployed. Her likelihood to retire rises more by an increase in wage and benefits if the husband is employed.

3.6 Conclusion

To retire or not to retire is a decision that is not easily made by most individuals. Many different factors determine whether people leave employment for good or whether they rather stay a few years longer in the labor force, e.g. economic aspects, social security regulations, the health status, the need to feel useful, or the importance of leisure. In the present paper, we analyze which role the spouse plays in that decision. Spouses' working decisions are very likely interdependent since they share resources like income and assets as well as their leisure time. Given the growing proportion of dual-worker couples, it becomes increasingly important to know more about spouses coordinating their retirement decision. Therefore, we estimate probabilities to stop and start working for older married men and women as a function of an extensive set of individual as well as spouse's socio-economic factors like wage and benefits, health status, and occupational characteristics. We further look for differences in these transition probabilities depending on the employment status of the spouse.

Our findings indicate that there is a relationship between the labor force states of two spouses that go beyond financial and health aspects. They rather seem to have a preference for shared retirement which also confirm previous research. The probability to leave employment is higher if the spouse is also not employed than if he/she is employed. If we explicitly distinguish between retirement and unemployment we find that only the probability to retire depends positively on the spouse being already retired. Husband's risk to become unemployed is not affected by the wife's employment status, whereas the wife's probability of becoming unemployed is higher if her husband is still employed. Furthermore, we find evidence for cross-spouse effects that, however, differ between men and women. For instance, the wife's wage reduces the husband's probability to stop working, whereas her benefits increase it. In contrast, the husband's financial incentives do not have any significant effect on the wife's probability to leave employment. The spouse's health status has also often a major and significant impact. The need to care for the partner apparently affects the individual's working decision at older age. However, we find again gender-specific differences. For wives, a bad health status of the husband increases the probability to stop working, in particular if he is already out of employment. For husbands, this only holds if she is not in employment. If she is still employed despite of her handicap his probability to stop working decreases.

Thus, the other spouse's employment status, income and health status are particularly important for the individual decision to retire or not. Nevertheless, the sign and the size of the impact differ between husband and wife.

3.7 Appendix

3.7.1 Descriptive statistics

Table 3.13: Sample means and standard deviations of husband's covariates

Variable	Status 1		2		3		4		Ass.
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	values
H: Age	55.08	3.89	56.97	4.38	60.30	5.23	63.42	4.37	55
H: Handicap	0.13	0.33	0.12	0.32	0.34	0.47	0.33	0.47	0
H: Pred. wage (in 1000 EUR of 2000)	1.85	0.87	1.67	0.86	0.58	0.54	0.34	0.42	1
H: Pred. benefits (in 1000 EUR of 2000)	0.38	0.23	0.47	0.28	0.56	0.30	0.65	0.32	1
H: Tenure	19.02	12.38	21.22	12.45	-	-	-	-	10
H: Hours worked (per week)	44.29	10.37	43.83	10.21	-	-	-	-	35
H: Blue-collar	0.31	0.46	0.33	0.47	-	-	-	-	0
H: White-collar	0.42	0.49	0.42	0.49	-	-	-	-	0
H: Public-empl.	0.29	0.45	0.25	0.43	-	-	-	-	0
H: Self-empl.	0.15	0.35	0.14	0.35	-	-	-	-	0
H: High-educ.	0.24	0.432	0.18	0.39	0.11	0.31	0.09	0.29	0
H: Medium-educ.	0.71	0.45	0.76	0.43	0.79	0.41	0.80	0.40	1
H: Low-educ.	0.05	0.21	0.06	0.23	0.10	0.30	0.10	0.31	Ref.
H: Leisure satisfaction very high	0.42	0.49	0.41	0.49	0.64	0.48	0.70	0.46	Ref.
H: Leisure satisfaction high	0.43	0.49	0.41	0.49	0.31	0.46	0.26	0.44	0
H: Leisure satisfaction low	0.11	0.31	0.13	0.33	0.03	0.17	0.03	0.18	0
H: Leisure satisfaction very low	0.04	0.20	0.06	0.23	0.02	0.14	0.01	0.11	0
H: Job satisfaction very high	0.48	0.50	0.49	0.50	-	-	-	-	Ref.
H: Job satisfaction high	0.40	0.49	0.41	0.49	-	-	-	-	0
H: Job satisfaction low	0.08	0.27	0.08	0.27	-	-	-	-	0
H: Job satisfaction very low	0.04	0.19	0.03	0.17	-	-	-	-	0
No. of observations	45,522		26,436		20,103		40,989		
No. of couples	1,186		848		678		1,178		

Table 3.14: Sample means and standard deviations of wife's covariates

Variable	Status 1		2		3		4		Ass.
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	values
W: Age	51.57	4.73	54.88	5.69	54.57	4.93	60.16	4.36	55
W: Handicap	0.08	0.28	0.21	0.41	0.10	0.30	0.24	0.43	0
W: Pred. wage (in 1000 EUR of 2000)	0.79	0.45	0.24	0.24	0.64	0.42	0.15	0.17	1
W: Pred. benefits (in 1000 EUR of 2000)	0.11	0.12	0.13	0.16	0.16	0.16	0.21	0.20	1
W: Tenure	14.10	10.30	-	-	14.24	10.90	-	-	10
W: Hours worked (per week)	31.33	13.29	-	-	32.03	13.39	-	-	35
W: Blue-collar	0.17	0.38	-	-	0.28	0.45	-	-	0
W: White-collar	0.67	0.47	-	-	0.61	0.49	-	-	0
W: Public-empl.	0.37	0.48	-	-	0.36	0.48	-	-	0
W: Self-empl.	0.08	0.28	-	-	0.08	0.27	-	-	0
W: High-educ.	0.15	0.36	0.06	0.23	0.10	0.30	0.03	0.17	0
W: Medium-educ.	0.75	0.44	0.74	0.44	0.74	0.44	0.70	0.46	1
W: Low-educ.	0.10	0.30	0.21	0.41	0.16	0.37	0.27	0.44	Ref.
W: Leisure satisfaction very high	0.41	0.49	0.56	0.50	0.37	0.48	0.63	0.48	Ref.
W: Leisure satisfaction high	0.42	0.49	0.33	0.47	0.46	0.50	0.30	0.46	0
W: Leisure satisfaction low	0.12	0.32	0.08	0.27	0.12	0.33	0.05	0.22	0
W: Leisure satisfaction very low	0.05	0.22	0.03	0.16	0.05	0.22	0.02	0.13	0
W: Job satisfaction very high	0.48	0.50	-	-	0.47	0.50	-	-	Ref.
W: Job satisfaction high	0.42	0.49	-	-	0.44	0.50	-	-	0
W: Job satisfaction low	0.07	0.26	-	-	0.07	0.26	-	-	0
W: Job satisfaction very low	0.02	0.15	-	-	0.01	0.12	-	-	0
No. of observations	45,522		26,436		20,103		40,989		
No. of couples	1,186		848		678		1,178		

Table 3.15: Sample means and standard deviations of household's covariates

Variable	Status 1		2		3		4		Ass.
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	values
Duration in this state	158.65	125.71	130.28	139.54	41.70	38.53	41.45	33.86	96
No. of persons in HH	2.40	0.73	2.38	0.77	2.21	0.56	2.11	0.47	2
HH's other inc. (in 1000 EUR of 2000)	0.99	1.18	1.00	1.03	0.89	0.85	0.73	1.15	0.7
East	0.32	0.47	0.25	0.43	0.38	0.48	0.37	0.48	0
Year 1996	0.03	0.17	0.05	0.21	0.03	0.18	0.03	0.17	Ref.
Year 1997	0.05	0.21	0.06	0.24	0.04	0.20	0.04	0.20	0
Year 1998	0.06	0.23	0.07	0.26	0.05	0.22	0.05	0.22	0
Year 1999	0.06	0.24	0.06	0.24	0.05	0.22	0.05	0.22	0
Year 2000	0.10	0.30	0.12	0.32	0.11	0.31	0.13	0.34	0
Year 2001	0.07	0.26	0.07	0.26	0.07	0.26	0.09	0.28	0
Year 2002	0.13	0.34	0.13	0.33	0.13	0.33	0.15	0.36	0
Year 2003	0.14	0.34	0.13	0.33	0.14	0.34	0.14	0.35	0
Year 2004	0.13	0.34	0.12	0.32	0.14	0.35	0.13	0.33	0
Year 2005	0.13	0.34	0.11	0.31	0.13	0.34	0.10	0.31	0
Year 2006	0.11	0.31	0.09	0.28	0.10	0.31	0.08	0.27	0
No. of observations	45,522		26,436		20,103		40,989		
No. of couples	1,186		848		678		1,178		

3.7.2 Estimation of wages and benefits

Since we can neither observe the wage of individuals who do not work nor the benefits of those who do work, we have to predict them. Therefore, we use a Heckman selection model.
Following Cameron and Trivedi (2009) (ch. 16), we assume two latent variables y_1^* and y_2^*. Let y_2 denote the wage (benefits) that we can only observe if $y_1 = 1$, that is, if the individual works (does not work). Thus, the two-equation model we use consists of a selection equation for y_1:

$$y_1 = \begin{cases} 1 & \text{if } y_1^* > 0 \\ 0 & \text{if } y_1^* \leq 0, \end{cases}$$

and an outcome equation for y_2:

$$y_2 = \begin{cases} y_2^* & \text{if } y_1^* > 0 \\ - & \text{if } y_1^* \leq 0. \end{cases}$$

We further assume a linear model with additive errors:

$$y_1^* = x_1'\beta_1 + \epsilon_1$$
$$y_2^* = x_2'\beta_2 + \epsilon_2,$$

with ϵ_1 and ϵ_2 possibly correlated. Since it is expected to be more robust than the maximum likelihood (ML) estimation, we use the two-step method which assumes a univariate normal distribution of the errors. Nevertheless, we compute standard errors by bootstrapping with 300 replications.
Moreover, the two-step method is based on the conditional expectation:

$$E(y_2|x, y_1^* > 0) \quad = \quad x_2'\beta_2 + \sigma_{12}\lambda(x_1'\beta_1),$$

where $\lambda(\cdot) = \phi(\cdot)/\Phi(\cdot)$. The rationale behind this model is that because $y_2^* = x_2'\beta_2 + \epsilon_2$, the conditional expectation is $E(y_2|x, y_1^* > 0) = x_2'\beta_2 + E(\epsilon_2|y_1^* > 0)$ and, given normality of the errors, $E(\epsilon_2|y_1^* > 0) = \sigma_{12}\lambda(x_1'\beta_1)$.
The $\lambda(\cdot)$-term can be estimated by $\lambda(x_1'\hat{\beta}_1)$, where $\hat{\beta}_1$ is obtained by a probit regression of y_1 on x_1. To get estimates of (β_2, σ_{12}) we regress y_2 on x_2 and the inverse Mills' ratio $\lambda(x_1'\hat{\beta}_1)$ with OLS.
We estimate ln(wage) and ln(benefits) for men and women separately. Tables 3.16 and 3.17 show the results. Because of missing values in crucial explanatory variables, the total number of observations in the MNL estimations is smaller than the number of observations used for the wage and benefit estimations. As

explanatory variables, the wage equations include years of education (years of schooling plus years of training/university), a quadratic term in labor force experience (sum of full- and part-time experience), firm tenure, and age, a dummy if he/she has a handicap of a degree ≥ 50 % (here called "severely handicapped"), a dummy whether the household lives in East Germany and the number of kids age 0 to 18 living in the household. However, the selection equations do not contain firm tenure and only include a linear term of labor force experience and age.

Due to the different retirement regulations, the benefits estimation equations slightly differ for husbands and wives. For both, we include years of education, a quadratic term in labor force experience, a dummy whether he/she is handicapped (that is, degree > 0 %), a dummy for being a foreigner, a dummy for living in East Germany, and year dummies (reference group: 1996). We include year dummies as a simplistic way to control for changes in retirement regulations. Since the level of benefits depends on the age of entry into retirement we also consider dummies for different age groups when the individual retired. For both sexes, the control group is retirement before age 60. However, in the husband's estimation we further distinguish between age 60–62 and retirement after age 62. Unfortunately, we do not observe the age of retirement for all individuals (e.g. if she retires before the sample period). We control for that with a dummy variable. Since children also affect the retirement benefits of women, we include the total number of births over their life course.

Table 3.16: Heckman two-step estimation of wages

	Husband		Wife	
	ln(wage)	Sel. eq.	ln(wage)	Sel. eq.
Years of education	0.0452***	0.1789***	0.1085***	0.1024***
	(0.0091)	(0.0150)	(0.0119)	(0.0137)
Lab. market exp.	-0.0290*	0.0966***	0.0439***	0.0656***
	(0.0162)	(0.0103)	(0.0108)	(0.0030)
Lab. market exp.^{2}	0.0001		-0.0004*	
	(0.0002)		(0.0002)	
Firm tenure	0.0285***		0.0270***	
	(0.0031)		(0.0046)	
Firm tenure^2	-0.0004***		-0.0003**	
	(0.0001)		(0.0001)	
Age	0.1981***	-0.2487***	0.0189	-0.1543***
	(0.0576)	(0.0118)	(0.0414)	(0.0060)
Age^2	-0.0015***		-0.0005	
	(0.0006)		(0.0004)	
Sev. handicapped	0.0978	-0.8587***	-0.0543	-0.6807***
	(0.0753)	(0.0764)	(0.1044)	(0.0818)
East	-0.3309***	-0.3779***	0.0361	-0.4900***
	(0.0339)	(0.0540)	(0.0549)	(0.0638)
No. of kids in HH	0.0127	0.1167	-0.0568*	-0.2171***
	(0.0153)	(0.0570)	(0.0338)	(0.0496)
Constant	1.3125	9.3915***	4.6304***	5.9833***
	(1.5903)	(0.4105)	(1.0387)	(0.3253)
λ	-0.4943***		0.1591	
	(0.1204)		(0.1828)	
No. of observations	156,263		162,995	
No. of clusters	2,717		2,836	
Chi2	1,181.131		722.428	

1) In parentheses: bootstrapped standard errors adjusted for clustering, repl.: 300.
2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.17: Heckman two-step estimation of benefits

	Husband		Wife	
	ln(benefit)	Sel. eq.	ln(benefit)	Sel. eq.
Years of education	0.0685***	-0.0060	0.0711***	-0.0864***
	(0.0063)	(0.0107)	(0.0132)	(0.0150)
Lab. market exp.	0.0103	-0.1859***	0.0221**	0.0124
	(0.0179)	(0.0192)	(0.0090)	(0.0113)
Lab. market exp.^{2}	-0.0001	0.0039***	0.0001	0.0005**
	(0.0004)	(0.0003)	(0.0001)	(0.0002)
Handicapped	-0.0390	0.9621***	0.2319*	1.1217***
	(0.0893)	(0.0570)	(0.1288)	(0.0630)
Foreigner	-0.4115***	-0.3358*	-0.3232	-0.2782
	(0.1610)	(0.1766)	(0.2019)	(0.2664)
H: Retired betw age 60–62	0.0477	0.0552		
	(0.0341)	(0.0633)		
H: Retired after age 62	0.0059	0.0463		
	(0.0594)	(0.0806)		
W: Retired after age 59			-0.0714	0.7990***
			(0.1016)	(0.0599)
Age of Ret. unknown	0.0739**		-0.0823**	
	(0.0348)		(0.0399)	
Total Number Of Births			-0.0279**	0.0355
			(0.0115)	(0.0236)
East	-0.3969***	0.2428***	0.0271	0.4900***
	(0.0340)	(0.0490)	(0.0690)	(0.0605)
Year 1997	0.0604***	0.1176***	0.0158	0.0044
	(0.0217)	(0.0345)	(0.0246)	(0.0371)
Year 1998	0.0723**	0.1817***	0.0443	0.0982**
	(0.0282)	(0.0406)	(0.0292)	(0.0450)
Year 1999	0.0719**	0.2207***	0.0659**	0.0004
	(0.0319)	(0.0457)	(0.0292)	(0.0493)
Year 2000	0.0747**	0.2207***	0.0755**	0.0651
	(0.0317)	(0.0457)	(0.0336)	(0.0520)
Year 2001	0.0456	0.1366***	0.0235	-0.1342**
	(0.0314)	(0.0514)	(0.0365)	(0.0580)
Year 2002	0.0220	0.1829***	0.0021	-0.0932
	(0.0325)	(0.0479)	(0.0361)	(0.0606)
Year 2003	0.1112***	0.2040***	0.0422	-0.1045*
	(0.0336)	(0.0523)	(0.0372)	(0.0628)
Year 2004	0.0971***	0.1931***	-0.0130	-0.1430**
	(0.0354)	(0.0537)	(0.0390)	(0.0628)
Year 2005	0.0889**	0.1467***	-0.0210	-0.2018***
	(0.0347)	(0.0573)	(0.0441)	(0.0623)
Year 2006	0.0620*	0.1012*	-0.0515	-0.2684***
	(0.0360)	(0.0580)	(0.0519)	(0.0649)
Constant	5.8488***	0.8741***	4.7919***	-1.0913***
	(0.2310)	(0.3310)	(0.3414)	(0.2082)

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Table 3.17 – continued from previous page

	Husband		Wife	
	ln(benefit)	Sel. eq.	ln(benefit)	Sel. eq.
λ	0.1584		0.1758	
	(0.1578)		(0.1841)	
No. of observations	170,933		170,933	
No. of clusters	2,923		2,923	
Chi2	463.306		283.837	

1)In parentheses: bootstrapped standard errors adjusted for clustering, repl.: 300.
2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.7.3 Full MNL estimation results

Table 3.18: MNL estimation results for states 1 and 2

	Original status 1		Original status 2	
	2	3	1	4
H: Age	-0.001143	0.015636	-0.020539	0.024224
H: Handicapped	-0.143782	-0.289869	0.175189	0.006235
H: Pred. wage in 1000	-0.081017	-0.811779***	0.027670	-0.841109***
H: Pred. benefits in 1000	0.203106	0.627004	-0.547337	0.817779*
H: Blue-collar	-0.213649	0.161611	0.057935	-0.418469
H: White-collar	0.049959	-0.127984	-0.062295	-0.455588**
H: Public empl	0.040392	-0.461861**	0.135582	0.127234
H: Self-empl	-0.300071	-0.902318**	-0.162627	-0.713557**
H: Firm tenure	0.001420	0.004380	-0.010918	0.000360
H: Actual hours worked	0.012042**	-0.007935	0.005078	-0.007452
H: Med.-educ	0.456947	0.609523*	0.245911	0.323990
H: High-educ	0.762587**	1.215915***	0.273106	0.567967
H: Leisure sat high	0.048660	-0.325593**	-0.222749	-0.109278
H: Leisure sat low	-0.111511	-0.653563***	-0.516695**	-0.214769
H: Leisure sat very low	0.267947	-1.012440	-0.705339**	-0.185424
H: Job sat high	0.029042	0.216354	0.140797	0.152253
H: Job sat low	-0.223295	0.995624***	0.298022	0.293733
H: Job sat very low	0.300523	1.218322***	0.554175*	0.814311**
W: Age	0.044370**	0.072160***	-0.043578**	0.001544
W: Handicapped	-0.669911**	0.248725	-0.974330***	-0.074343
W: Pred. wage in 1000	-0.610595*	0.734883**	1.287166***	-0.626606
W: Pred. benefits in 1000	2.673376***	-1.124980	-0.694142	0.568209
W: Blue-collar	0.289730	0.698534		
W: White-collar	-0.135660	0.471776		
W: Public empl	-0.207422	0.180059		
W: Self-empl	0.103413	1.256483		
W: Firm tenure	-0.012119	-0.006737		
W: Actual hours worked	-0.017048**	0.002703		

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Table 3.18 – continued from previous page

	Original status 1		Original status 2	
	2	3	1	4
W: Med.-educ	-0.142629	-0.415640*	-0.283959	0.158052
W: High-educ	-0.150381	-1.103995***	-0.732287*	0.614274
W: Leisure sat high	0.031530	0.376492**	0.202554	-0.045334
W: Leisure sat low	-0.005360	0.294228	0.122183	0.384683
W: Leisure sat very low	0.100760	0.679025**	0.283324	-0.060556
W: Job sat high	0.050558	0.199946		
W: Job sat low	0.692180***	-0.070108		
W: Job sat very low	0.978711***	-0.868057		
No. of persons in HH	0.173682	0.347804***	0.132896	-0.231482*
HH's other income in 1000	-0.076114	-0.037836	0.136390**	0.068878
Duration	-0.010467***	-0.010138***	-0.019887***	-0.004317**
Duration sq.	0.000020***	0.000021***	0.000034***	0.000010**
East	-0.127146	-0.133978	-0.112373	-0.163894
Year 1997	0.281848	-0.353890	-0.063580	-0.454671
Year 1998	-0.026217	-0.453879	-0.165530	-0.043491
Year 1999	0.030853	-0.625715	0.173810	-0.406049
Year 2000	0.251706	0.074597	0.164708	-0.643345**
Year 2001	0.361071	-0.293486	0.066993	-0.130925
Year 2002	0.358666	-0.287525	-0.118602	-0.479360
Year 2003	0.264970	-0.497804	-0.484554	-0.353237
Year 2004	-0.120746	-0.216741	0.027748	-0.615871**
Year 2005	0.002349	-0.206576	0.132758	-0.668291**
Year 2006	0.319073	-0.580539	0.018994	-0.861843**
Constant	-7.056131***	-9.463445***	-0.300197	-3.881970
No. of observations	45,522		26,436	
No. of clusters	1,186		848	
Pseudo R2	0.0889		0.1211	

1)In parentheses: bootstrapped standard errors adjusted for clustering, repl.: 300.
2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.19: MNL estimation results for states 3 and 4

	Original status 3		Original status 4	
	1	4	2	3
H: Age	-0.091251**	0.017694	-0.064873**	0.044099
H: Handicapped	-0.818247**	0.278703	-0.564860**	0.238494
H: Pred. wage in 1000	0.186756	0.236594	0.244641	0.092780
H: Pred. benefits in 1000	0.156026	-0.196058	0.067302	-0.616831
H: Med.-educ	0.270601	0.004035	0.413187	0.380482
H: High-educ	0.272408	-0.217048	0.097920	0.326227
H: Leisure sat high	0.254733	-0.088115	0.451094**	0..247101
H: Leisure sat low	0.409304	-0.285092	1.063556**	-1.079340
H: Leisure sat very low	0.491338	-0.164455	1.450273***	0.237250

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Table 3.19 – continued from previous page

	Original status 3		Original status 4	
	1	4	2	3
W: Age	0.028979	0.060259	-0.002489	-0.074119***
W: Handicapped	0.690461	-1.357834***	0.608786**	-0.279434
W: Pred. wage in 1000	0.214482	-1.294565***	0.236614	2.120118***
W: Pred. benefits in 1000	-1.798457	3.615767***	-0.069062	-0.733401
W: Blue-collar	0.188170	-0.406815		
W: White-collar	0.469469	-0.400636		
W: Public empl	-0.306487	0.109100		
W: Self-empl	0.645249	-0.511346		
W: Firm tenure	0.004296	0.000468		
W: Actual hours worked	0.006100	-0.004063		
W: Med.-educ	0.098132	-0.056231	0.194961	-0.047076
W: High-educ	-0.409742	0.393762	0.804908	-0.865487
W: Leisure sat high	-0.018261	-0.222953	-0.085588	-0.105476
W: Leisure sat low	0.060202	-0.672993**	-0.180139	0.172949
W: Leisure sat very low	-0.019079	-0.422648	-1.506499	0.466432
W: Job sat high	-0.022050	0.244575		
W: Job sat low	0.226129	0.527532		
W: Job sat very low	0.050062	1.042673**		
No. of persons in HH	0.172423	-0.097976	0.131438	-0.114649
HH's other income in 1000	0.110243	0.114360	0.072236	0.094460*
Duration	-0.059904***	-0.025846***	-0.054697***	-0.043790***
Duration sq.	0.000225***	0.000092**	0.000233***	0.000163
East	0.250606	0.154325	0.027109	0.423047
Year 1997	-0.052845	0.010212	0.559315	0.587826
Year 1998	0.154503	-0.472696	0.076108	0.965261
Year 1999	0.156343	-0.056619	0.164199	0.318068
Year 2000	0.069044	-0.218488	-0.073354	0.332488
Year 2001	-0.020699	-0.238108	0.211737	0.421471
Year 2002	-0.073200	-0.231816	0.020414	0.505676
Year 2003	0.012126	-0.213515	-0.354725	0.635099
Year 2004	0.042412	-0.078950	-0.047048	0.825160
Year 2005	0.203006	-0.272351	-0.092218	0.550965
Year 2006	0.091833	-0.241730	-0.142548	0.473480
Constant	-0.816806	-7.305611**	-1.118519	-3.776343
No. of observations	20,103		40,989	
No. of clusters	678		1,178	
Pseudo R2	0.1307		0.1233	

1)In parentheses: bootstrapped standard errors adjusted for clustering, repl.: 300.

2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.7.4 Tests of IIA

In the following, we present the results of two tests for the IIA assumption, namely a Hausman-McFadden-type test for clustered data and the Small-Hsiao test (see Hausman and McFadden, 1984; Small and Hsiao, 1985). The results of the Hausman-McFadden test suggest that the IIA assumption is not problematic in our estimations, whereas the Small-Hsiao test does not give clear evidence. However, for the majority, independence cannot be rejected.

Table 3.20: Hausman-McFadden test and Small-Hsiao test

	Hausman-McFadden			Small-Hsiao		
Omitted	Chi2	P>Chi2	Evidence	Chi2	P>Chi2	Evidence
Original Status 1						
2	35.72	0.959	for H_0	61.33	0.176	for H_0
3	41.50	0.851	for H_0	55.65	0.339	for H_0
Original Status 2						
1	29.08	0.948	for H_0	39.33	0.631	for H_0
4	40.53	0.579	for H_0	40.06	0.600	for H_0
Original Status 3						
1	24.43	0.990	for H_0	164.60	0.000	against H_0
4	25.15	0.986	for H_0	61.12	0.036	against H_0
Original Status 4						
2	22.78	0.928	for H_0	112.54	0.000	against H_0
3	23.41	0.914	for H_0	22.48	0.935	for H_0

H_0: Odds(outcome J vs outcome K) are independent of other alternatives.

3.7.5 Transitions in the modified model

Table 3.21: Employment status transitions in the modified model

	Destination State									
Origin	1	5	6	7	8	9	10	11	12	Total
1	44,847	216	128	150	180	0	0	0	0	45,521
	(98.52)	(0.47)	(0.28)	(0.33)	(0.40)	(0.00)	(0.00)	(0.00)	(0.00)	(100.00)
5	242	21,262	50	0	0	225	0	0	54	21,833
	(1.11)	(97.38)	(0.23)	(0.00)	(0.00)	(1.03)	(0.00)	(0.00)	(0.25)	(100.00)
7	124	0	0	15,135	29	135	0	63	0	15,486
	(0.80)	(0.00)	(0.00)	(97.73)	(0.19)	(0.87)	(0.00)	(0.41)	(0.00)	(100.00)

Percentages in parentheses.

3.7.6 Full MNL estimation results of modified models

Table 3.22: MNL estimation results for state 1 (modified)

	Original status 1			
	5	6	7	8
H: Age	0.028912	-0.048686**	0.012217	0.026153
H: Handicapped	0.065315	-0.430636	-0.014663	-0.443477
H: Pred. wage in 1000	0.052152	-0.444580*	-0.865720***	-0.620238***
H: Pred. benefits in 1000	0.144264	0.314175	0.644831	0.361928
H: Blue-collar	-0.265183	-0.141187	-0.011524	2.180299**
H: White-collar	0.159516	-0.020124	-0.430581	1.981084*
H: Public empl	-0.368923*	0.441097*	-0.101122	-0.619344**
H: Self-empl	-0.590028*	0.178133	-0.439545	0.335940
H: Firm tenure	-0.000664	0.011419	0.028978***	-0.026594***
H: Actual hours worked	0.012760*	0.004692	-0.022199**	0.002489
H: Med.-educ	0.763875*	0.244887	0.015822	1.107515**
H: High-educ	1.143777**	0.591291	0.458669	1.611239***
H: Leisure sat high	-0.037347	0.117400	-0.211708	-0.468155**
H: Leisure sat low	0.095227	-0.727719*	-0.141100	-1.166075***
H: Leisure sat very low	0.427661	0.120594	-0.746428	-1.844771***
H: Job sat high	-0.033039	0.038389	-0.059964	0.564930**
H: Job sat low	-0.183694	-0.068182	0.347054	1.527386***
H: Job sat very low	0.090133	0.766680**	0.647305*	1.742241***
W: Age	0.052796*	0.024316	0.071443**	0..088353***
W: Handicapped	-0.766253**	-0.455316	0.486476	0.213067
W: Pred. wage in 1000	-0.806831**	-0.596336	0.542015	1.188094**
W: Pred. benefits in 1000	3.556027***	0.829709	-1.559577	-1.523270
W: Blue-collar	0.086500	0.057950	1.378246***	1.329704*
W: White-collar	-0.404301	-0.187188	0.895275*	1.153044*
W: Public empl	-0.040762	-0.352631	0.165898	0.244306
W: Self-empl	0.302210	-1.164809*	1.432323***	2.147648***
W: Firm tenure	0.006634	-0.063211***	0.011359	-0.025709**
W: Actual hours worked	-0.028958**	0.006914	-0.005783	0.010924
W: Med.-educ	-0.252438	0.116351	0.186062	-1.093997***
W: High-educ	-0.346055	0.207472	0.011314	-2.232063***
W: Leisure sat high	-0.009021	0.188095	0.375886*	0.307221
W: Leisure sat low	-0.350249	0.317767	0.214209	0.303175
W: Leisure sat very low	0.334075	-0.161184	-0.267954	0.966604***
W: Job sat high	0.103370	0.069681	0.231124	0.081002
W: Job sat low	0.354631	0.809781***	0.057891	-0.146387
W: Job sat very low	1.023998***	0.965063**	-0.492403	-1.549740*
No. of persons in HH	0.284649**	-0.044449	0.294565**	0.472423***
HH's other income in 1000	-0.051301	-0.007743	0.000282	-0.196378
Duration	-0.011459***	-0.007777***	-0.004047	-0.013733***
Duration sq.	0.000023***	0.000015**	0.000010*	0.000026***
East	-0.591674**	0.264112	-0.426813	0.219796
Year 1997	-0.024647	1.012751	-1.121292	0.123459

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Table 3.22 – continued from previous page

	Original status 1			
	5	6	7	8
Year 1998	-0.320318	0.839817	-0.839895	-0.236181
Year 1999	-0.147395	0.750391	-0.888073	-0.403390
Year 2000	-0.088039	1.121095*	-0.048926	0.282998
Year 2001	-0.152772	1.408014**	-0.235402	-0.336321
Year 2002	0.444699	0.767741	-0.792437	-0.097016
Year 2003	0.067538	0.906317	-0.730853	-0.254941
Year 2004	-0.311055	0.661268	-0.667655	0.175687
Year 2005	-0.009677	0.537419	-0.345262	-0.186481
Year 2006	0.476496	-0.091719	-0.453072	-0.657850
Constant	-9.667030***	-4.298355	-10.102629***	-14.849578***
No. of observations	45,521			
No. of clusters	1,186			
Pseudo R2	0.12311			

1)In parentheses: bootstrapped standard errors adjusted for clustering, repl.: 300.

2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.23: MNL estimation results for states 5 and 7

	Original status 5		Original status 7	
	9	12	9	11
H: Age	0.039005	0.026521	-0.050053	0.127260***
H: Handicapped	0.028470	0.425680	0.055055	0.940972***
H: Pred. wage in 1000	-0.660909***	-0.916695***	0.023404	0.583386
H: Pred. benefits in 1000	0.994292*	-1.505059*	0.601643	-1.851119**
H: Blue-collar	-0.803646***	14.629289***		
H: White-collar	-0.564166**	14.383273***		
H: Public empl	0.016022	-0.401334		
H: Self-empl	-0.822338**	14.354930***		
H: Firm tenure	0.011320*	-0.031160*		
H: Actual hours worked	-0.012724	0.001403		
H: Med.-educ	0.332728	0.576480	0.105892	-0.136787
H: High-educ	0.457912	0.579042	-0.056357	-0.844220
H: Leisure sat high	-0.322953*	0.335672	-0.010425	-0.200825
H: Leisure sat low	-0.880277**	-0.040293	-0.874172	0.466550
H: Leisure sat very low	-0.095903	0.847978	-0.269247	-13.922768***
H: Job sat high	0.027965	0.472955		
H: Job sat low	0.117489	1.097076**		
H: Job sat very low	0.905099***	0.894628		
W: Age	0.033448	-0.041498	0.169494***	0.006005
W: Handicapped	-0.324145	0.337640	-1.322019***	-1.000091
W: Pred. wage in 1000	0.016305	-1.099676	-0.833226*	-0.988373
W: Pred. benefits in 1000	1.201600*	0.595561	4.084369***	0.432215
W: Blue-collar			-0.269034	-0.267194

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Table 3.23 – continued from previous page

	Original status 5		Original status 7	
	9	12	9	11
W: White-collar			-0.098381	-0.331735
W: Public empl			0.374211*	-0.519418
W: Self-empl			-0.199707	-2.169771**
W: Firm tenure			0.004714	-0.037040
W: Actual hours worked			-0.019284**	0.038463***
W: Med.-educ	-0.000010	0.428141	-0.300931	0.512497
W: High-educ	0.375958	1.647640	0.167825	-0.300511
W: Leisure sat high	0.072940	-0.180793	-0.319414	-0.017935
W: Leisure sat low	0.336847	-0.241396	-0.296580	-0.758895
W: Leisure sat very low	0.494892	-16.091586***	-0.399215	0.223650
W: Job sat high			0.260803	0.478941
W: Job sat low			0.191658	0.194475
W: Job sat very low			0.521554	1.489327**
No. of persons in HH	-0.288207	-0.026013	0.090203	-0.015958
HH's other income in 1000	0.085175	-0.039682	0.264983**	-0.009770
Duration	-0.002235	-0.010185**	-0.017889***	-0.002671
Duration sq.	0.000005	0.000027***	0.000065**	-0.000211
East	-0.609884**	0.155395	-0.168540	0.802513*
Year 1997	-0.544202	0.987040	0.141134	-0.087844
Year 1998	-0.344208	1.093957	-0.583376	-0.911087
Year 1999	-0.493555	1.260657	-0.383791	0.213422
Year 2000	-0.955261**	0.927647	-0.084822	-0.800463
Year 2001	-0.326107	0.259437	0.196246	-0.818353
Year 2002	-0.607488*	0.689769	-0.297021	-0.866337
Year 2003	-0.671066*	0.670453	-0.223871	-0.811819
Year 2004	-0.746985**	0.650589	0.212275	-0.674620
Year 2005	-1.048569***	1.256069	-0.139045	-0.559414
Year 2006	-0.950419**	-0.705163	0.234399	-0.956799
Constant	-6.541910**	-19.044689***	-11.223680**	-12.573393**
No. of observations	21,833		15,486	
No. of clusters	714		506	
Pseudo R2	0.15286		0.16034	

1)In parentheses: bootstrapped standard errors adjusted for clustering, repl.: 300.

2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3) Results for destination states 1 and 6 out of state 5 and 1 and 8 out of state 7 are not presented.

Part II

Divorce determinants

Chapter 4

Impact of educational and religious homogamy on marital stability[1]

[1]This chapter is based on the IZA Discussion Paper No. 4491 of the same title, co-authored by Kornelius Kraft.

4.1 Introduction

Over the last 40 to 50 years, most Western societies experienced dramatic changes in common family structures. Cohabitation, for example, is no longer a lifestyle disapproved of by many people and has become rather common among couples before marriage. Another remarkable phenomenon is the large increase in divorce rates. In West Germany, the number of divorces per 10,000 marriages rose from 35.7 in 1960 to 118.4 in 2004 (see Statistisches Bundesamt, 2005). However, divorce is usually a quite painful and far-reaching experience in life for all persons involved. It is a decision of serious consequences. Given the steady increase in recent decades, many researchers from different fields like economics as well as genetics, sociology or psychology have tried to shed light on the determinants of this decision. Other studies focus on the financial and non-financial consequences, in particular for women and children.

The present paper refers to one strand of the economic literature that tries to find out which factors make an optimal match of husband and wife. That is, which personal characteristics and which combinations of those have a stabilizing effect on marriage? Do marriages between individuals who are similar to each other generally have a lower divorce probability? Gary Becker's household theory predicts that negative assortative mating (that is, mating of unlikes) is optimal concerning wage earnings capacity because it increases gains from specialization in market and domestic work, respectively. For all other factors that are complements in household production, homogamy should have a stabilizing impact on marriage. Therefore, similar age, height, attitudes etc. should decrease the probability of divorce (see Becker, 1973, 1974a; Becker et al., 1977).

Our empirical analysis concentrates on the effects of similarity in religion and education on the risk of divorce. The reason for our choice is that education's impact is, from theory, a priori not clear. On the one hand, education has a large impact on the individual's wage earnings capacity so that homogamy increases the divorce probability. On the other hand, education contains a social and cultural element. In this respect, similarity should have a stabilizing effect. Moreover, education is also related to the timing of marriage, labor supply, fertility as well as to preferences concerning the optimal labor division between husband and wife. Hence, education may influence marital stability in many ways and an empirical test is necessary to obtain a better understanding which aspects dominate. Does the traditional pattern of a higher educated husband promise a lower risk of disruption or are modern relationships with two equally educated spouses more stable? What happens if the wife is better educated than the husband? These questions have been largely neglected by the economic literature but have been discussed more intensively by sociologists. Nevertheless, neither the international

nor the (small) German literature give clear evidence. Some find educational homogamy a stabilizing factor (e.g. Weiss and Willis, 1997), whereas other studies conclude that it is less a matter of similarity but the question of educational level and whether the husband or the wife has a better education (e.g. Charles and Stephens, 2004).
In our opinion, religiousness is a good indicator to assess the extent to which similar attitudes (here towards God, marriage and family) affect the risk of separation. In general, individuals that attend church services have probably a more traditional view on marriage and family and are therefore less prone to divorce than non-religious people. The question is, however, what effects dissimilar preferences in this respect have. Do couples of two non-religious spouses have a lower risk of separation than couples with only one spouse being religious because of their homogenous preferences in this respect? For US couples, Charles and Stephens (2004), Bumpass et al. (1991), and Bumpass and Sweet (1972) find that couples with the same religious denomination have a lower probability of separation. However, to our knowledge, no empirical study exists that analyze this question for Germany.

Using data from the German Socio-Economic Panel (SOEP) from 1984 to 2007 we investigate the effects of individual educational level, church attendance, and spousal combinations of those on the risk of separation. We apply complementary log-log (cloglog) regression models with couple-specific random effects to control for unobserved heterogeneity. We restrict our analysis to West German couples that have been observed since the beginning of their marriage. Even though we focus on the effects of education and church attendance, we, nevertheless, control for various other important factors like age at marriage, number of children, or hours worked. Concerning education, we do not only distinguish whether or not both have the same degree as commonly done in the literature but we also differentiate between three levels. In contrast to the few existing German studies, information about church attendance is available for both spouses. In either case, we consider changes in the explanatory variables over the course of marriage and do not restrict our analysis to the situation at the beginning of marriage.
Our results do not generally confirm the stabilizing effect of homogamy. Apparently, positive assortative mating with respect to education does not enhance the stability of marriage even after controlling for hours worked and unemployment experience. It rather depends on whether one or both spouses are only low-educated since these couples have a higher risk of divorce. Moreover, we do not find gender-specific differences. As expected, people that attend religious events have a lower divorce probability. The stabilizing effect is even stronger if spousal combinations are considered. Couples where both spouses participate

in religious activities are significantly more stable than any other combination. However, homogamy per se once more does not lower the risk of divorce.

The Chapter is structured as follows. Section 4.2 contains a discussion about the effects of education and religious affiliation on marital stability in the context of the two most important theoretical frameworks. Section 4.3 reviews the relevant empirical literature, whereas Section 4.4 describes the empirical approach and the data used. In Section 4.5, empirical results are presented. A conclusion is given in Section 4.6.

4.2 Theoretical discussion on the effects of education and religious affiliation

There are two classes of theoretical frameworks modeling the decision-making of a family. So-called *unitary models* or *traditional household models* assume a joint utility function for all household members, whereas the second class is based upon bargaining theory.[2]
In the following, the two types are shortly presented in the context of marital stability. The focus is on the models' predictions concerning the relationship between the risk of divorce on the one hand, and education and religiousness on the other hand. Nevertheless, other factors are also discussed since they are influenced by education, e.g. labor supply or age at marriage.

4.2.1 Unitary models

Gary Becker is one of the most important contributors to the advancement of family economics. With his "Theory of Marriage" and later extensions (Becker, 1973, 1974a; Becker et al., 1977), he provided a framework that is still the basis for many analyses concerning the behavior of families.
The main implication of his model is that the family acts as if it were maximizing a joint utility function that incorporates the preferences of all family members. Utility depends on household goods like children, love, and affection. They are produced within the household with market goods and time of household members as input factors. Their productivity is influenced by environmental variables like household's human capital or individuals' health status. The model implies that two persons marry when the expected utility from being married exceeds the expected utility from remaining single. Analogously, married couples separate when the expected utility from remaining married falls below the expected

[2]For a more detailed review of theories of family decision-making, see e.g. Bergstrom (1997).

utility from divorcing and possibly remarrying. One reason for this turnover in expected utilities can be an unpredictable change in personal traits of the spouse that may cause the partner to reconsider the marriage decision. Thus, in such a stochastic framework, the probability of divorce depends on the expected gains from marriage and the distribution of unanticipated gains/losses from marriage. One objective of Becker's household model is to find characteristics and spousal combinations that minimize this probability of divorce by influencing the gains from marriage and their uncertainty.

In the Beckerian world, the gains from marriage do not only rely on economies of scale by joining households. The main factor is the complementarity of a man and a woman in the home production of household goods. Thus, these gains rise with increasing complementarity of inputs, namely market goods and time. This implies that the one with the higher wage earnings capacity should specialize in market work so that the household can afford more market goods. The other one should use his or her time for home production. This specialization gain is larger the higher the wage difference between the two spouses. Moreover, specialization implies a mutual dependence between the both mates. According to Becker, this aspect is the major incentive for partners to marry and, in the periods following, to stay together. Thus, every factor that makes the division of labor between husband and wife less advantageous decreases the mutual dependence and therefore raises the risk of marital disruption. Hence, negative assortative mating concerning wage earnings capacity (or other factors that are substitutes in the production of household commodities) is optimal.

In principle, Becker's theory is gender-neutral. However, the economic provider role is traditionally assigned to husbands and the homemaker role to wives, this is to a certain degree due to the lower investments in human capital by women in the past. Consequently, the increase in educational attainment and labor market activity of wives can be partially responsible for the rise in divorce rates in the last decades. By growing equalization of men and women, the incentives to marry and if married to stay together are reduced.[3]

Becker also provides an extensive analysis of optimal sorting with respect to other factors. He finds that positive assortative mating, i.e. mating of likes, is optimal for all other characteristics that are complements in household production. Hence, homogamy with respect to interests, religiousness, age, etc. should stabilize a partnership. He further shows that, given positive assortative mating is optimal, gains from marriage are higher for people with higher values of characteristics.

[3]There is also evidence, however, that educational institutions are very efficient marriage markets that lower search costs. See e.g. Lewis and Oppenheimer (2000) or Nielsen and Svarer (2006).

In our opinion, religious affiliation is a good candidate to get information about the impact of harmony in preferences. On the one hand, it stands for a traditional attitude towards marriage. Religious people also usually live in an environment with religious peers that may stigmatize divorced couples more than unreligious people. On the other hand, probably even more important than the individual attitude is the conformity of the spouses' preferences in this respect. It is very likely that individuals prefer a spouse who is of the same opinion concerning the importance of religion and hence, of marriage. Their relationships should therefore be more stable than between spouses with different views.
In contrast, the impact of education is not that straightforward: education determines wage earnings capacity so that homogamy makes specialization and consequently marriage less advantageous. However, education is part of the general process of socialization and may represent individual's preferences for the way of living. In this respect, similarity has a stabilizing effect that would further increase with higher education. The impact of the individual level is not obvious either: a good education improves the opportunities on the labor market which in turn makes an individual more independent from the partner. Hence, high education can destabilize a relationship. However, individuals with higher education are supposed to be more intelligent than others. This might imply that they are better able to form expectations about their spouse and his or her future characteristics. Therefore, they are less likely to become disappointed. An alternative interpretation is that they are better in finding a partner who is suited for lifetime. Both explanations would imply an inverse relationship between education and risk of divorce. In summary, the effects of education and its spousal combinations on marital stability are ambiguous. Moreover, the aspect of preferences concerning the educational level of the spouse is less clear than in the case of religiousness. Some may still prefer the traditional labor division and therefore look for a partner with a different education than the own. Others may search for an equal spouse. Hence, the effect of education on marital stability via preferences is a priori also not clear.

Another uncertainty-reducing factor is the search duration on the marriage market. A longer or more intensive search should enhance the match quality because an individual gathers more information about potential mates and own preferences concerning the optimal partner. In empirical estimations, this factor is usually captured by age at the time of marriage. A higher age at marriage should stabilize a relationship because it usually implies a longer search history.[4] Nev-

[4]The effect may not be continuously negative. There might exist an age threshold from which on a person accepts a match of lower quality in order to save further search costs. As a consequence, chance of divorce would be higher. However, we did not find evidence for a non-linear relationship in our data.

ertheless, there is no way to fully eliminate uncertainty. A typical example for unmet expectations is unemployment. It can be interpreted as a negative shock for each employed person that cannot only lower household's income but also self-esteem and self-confidence. These consequences affect marital stability negatively if gains from marriage are substantially reduced for at least one partner. As other labor force behavior variables, the risk of unemployment is also affected by education. Higher educated individuals have a lower probability of losing the job. Another important aspect of marriage that is related to (women's) education is fertility. The Becker model considers children as marital-specific investments that stabilize a relationship. These "commodities" increase the gains from marriage since they make divorce more costly and thus, lower the probability that it occurs. Children from previous relationships, however, are usually not subsumed under marital-specific investments.

Some of the main assumptions of the unitary framework are subject of criticism. For example, it is not explicitly modeled in which way the individual preferences are incorporated in the joint utility function. Becker (1974b, 1981) suggests that it represents the utility function of the altruistic head of the family. In this case, the marital good is divided equally between the two spouses (neglecting other family members for simplicity reasons). Alternatively, one interprets the family utility function as the consensus between the members. On the whole, each interpretation is quite restrictive. Moreover, pooling of income is difficult to justify if each family member has different outside options. Furthermore, in times of increasing education and labor force participation rates of married women it is questionable that specialization still (if ever) constitutes the most important part of the gains from marriage. Nevertheless, despite their limitations, unitary models are still often used due to their simplicity and less stringent data requirements.

4.2.2 Models with household bargaining

The second class of models based on bargaining theory allows explicitly for conflicts of interest and provide a mechanism by which family behavior is formed from individual preferences. It distinguishes between *cooperative* and *non-cooperative* bargaining solutions.[5] Most popular is, however, the cooperative Nash-bargaining model which we present in the following (see Nash, 1950). Some authors have questioned cooperative and have favored non-cooperative models. However, in our opinion, if marriage is not suited for a cooperative solution, then the Nash-bargaining solution may not be used for any situation. Members of a family

[5]Chiappori has formed the term *collective* models for his cooperative models. See e.g. Chiappori (1992); Blundell et al. (2005).

should be able to make binding agreements. Nevertheless, Binmore et al. (1986) derive the Nash-bargaining solution as the approximation of a non-cooperative game and show that this solution has a quite general theoretical foundation.

The Nash-solution to distributional problems between two spouses, m and f, is the allocation of goods (x_m, x_f) that maximizes the product of the two persons' utility gains over the outcome in case of disagreement (s_m, s_f):

$$\max_{x_m, x_f} (x_m - s_m)^{\beta}(x_f - s_f)^{1-\beta} \tag{4.1}$$

subject to

$$x_m + x_f = X. \tag{4.2}$$

β is a parameter representing the (potentially asymmetric) relative bargaining power between both partners. X stands for the output of a marital production process defined as the output of home produced commodities (e.g. cooking, washing, child care) and consumption goods. In principle, both could be measured in monetary terms but often home produced goods are not. The outcome in case of disagreement (s_i) is also often called *threat point*. The exact definition is problematic and at the same time crucial for the outcome of these models. In their analyses about household decision-making in a bargaining framework, Manser and Brown (1980) and McElroy and Horney (1981) define the individual situation in case of divorce as the threat point. Even though the credibility of a divorce-threat is questionable in day-to-day decisions, its use in studies of divorce probabilities should be appropriate.[6] Non-marketable goods like trust and mutual support are not included in X even though they are very important factors for a successful partnership.[7] It can be assumed that they either do not require time as input but other resources or that the time invested in the production of these particular goods is not associated with disutility like working in the labor market. Nevertheless, if these goods are absent, living together with a partner could create a public bad instead of a public good. In these cases, a spouse makes forecasts about the permanence of this situation and evaluates the utility derived from monetary as well as non-monetary factors. Marriage does only end in divorce if there is no monetary compensation high enough for the unhappy situation. Therefore, we restrict our analysis to measurable factors but keep in mind the existence of unobservable causes of divorce.

[6] Other authors, e.g. Lundberg and Pollak (1993) as well as Konrad and Lommerud (1995), favor non-cooperative behavior within the household as the relevant threat point.

[7] Manser and Brown (1980) also include the partner's personal characteristics to those factors that determine the systematic utility of each individual. According to them, personal attributes of the partner like education and religion may also affect the utility out of consumption.

Solving the above optimization problem with respect to x_m and x_f yields:

$$x_m - s_m = \beta X - \beta(s_m + s_f) \tag{4.3}$$

and

$$x_f - s_f = (1 - \beta)X - (1 - \beta)(s_m + s_f). \tag{4.4}$$

It becomes obvious that the division of the marital output is probably not the same for husband and wife. It is determined by the relative bargaining power within marriage as well as the threat points.
Similarly to the unitary model, the effect of education is not clear in this framework. Higher education improves labor market opportunities which in turn raises the threat point as well as the bargaining power. From this point of view, education and marital stability are negatively related. On the other hand, better labor market opportunities of both spouses may lead to a higher family income and thus, to a higher systematic utility out of consumption for both. As already discussed in Section 4.2.1, the aspect of preferences concerning the educational level of the spouse (as modeled in Manser and Brown, 1980) is ambiguous.
The threat point is also determined by the probability of finding a more suitable partner than the current one. It can be reasoned that living in the city raises the probability of finding a better match which in turn increases the probability of marital disruption. Similarly, a working spouse might not only have a higher risk of divorce due to his or her financial independence but also because of a higher probability to meet a more suitable partner. Our previous discussion on the effects of religiousness applies to the bargaining model as well.

4.3 Literature review

Due to the steady increase of divorce rates in the last 50 years, the literature on divorce is quite extensive. Studies coming from different fields like economics, sociology, psychology, or genetics have analyzed various factors that may account for this trend and examined the consequences for the people involved. In contrast, our analysis is related to the literature about marital sorting and its impact on divorce which is far from being extensive in economics. More empirical studies can be found in the sociological literature that, however, does not provide clear evidence concerning the effects of educational homogamy and only little is known regarding religious homogamy in European countries (see Kalmijn et al., 2005).
As shown in Section 4.2.1, Becker et al. (1977) derived numerous hypotheses con-

cerning the effect of various spousal characteristics on the risk of divorce. However, they were not able to test all of them because of data restrictions. With respect to own education, they do not find any statistically significant effect for the US which confirms their predicted ambiguity. In contrast, marrying outside one's own religion increases the probability of dissolution significantly. Weiss and Willis (1997) distinguish between the effects of an initially bad match and unexpected events while being married using data from the US-National Longitudinal Survey of High School Class 1972. In their empirical analysis, homogamy with respect to religion as well as education stabilizes a marriage. In addition, they observe a lower divorce probability the higher the education of at least one spouse. In contrast, Charles and Stephens (2004) conclude that "the effect of education on marriage stability is less a matter of the similarity in schooling between husbands and wives as whether the couple is highly educated or not and whether it is the husband or wife with higher level of schooling" (Charles and Stephens, 2004, p. 507). Namely, the reduction in divorce probability compared to the reference group is even higher for couples with a higher-educated husband than for couples with a higher-educated wife.

Sociologists also usually refer to Gary Becker's household model if they analyze divorce determinants.[8] Bumpass and Sweet (1972), one of the earliest studies on the impact of homogamy, and Bumpass et al. (1991) use the 1970 National Fertility Study and the National Survey of Families and Households (1987–1988) for the US, respectively. They find an inverse relationship between wife's educational attainment and the probability of divorce. However, their findings do not generally support the hypothesis that educational heterogamy is associated with a higher divorce risk. Instead, results of Bumpass et al. (1991) suggest that couples with a better educated wife have the highest risk of dissolution, followed by couples of the same education, whereas couples with a higher-educated husband have the lowest divorce probability. In contrast, Tzeng and Mare (1995), using US data from the National Longitudinal Surveys of Youth, of Young Men, and of Young Women, show that more education reduces the probability of dissolution, whereas heterogamy does not affect it. Finnäs (1997) find this pattern with Finnish data, too. In contrast to Charles and Stephens (2004), they do not observe a difference whether the husband or the wife is higher educated. These mixed results are also reflected in an international comparison of nine countries initiated by Blossfeld and Müller (2002). The analysis for West Germany (Müller, 2003) shows a (weakly) significant higher probability of divorce if the husband is higher educated than the wife compared to educationally homogamous couples. Previous research has, however, arrived at different conclusions with German

[8] For a detailed overview of the German research on divorce determinants, see e.g. the German meta-analysis by Wagner and Weiss (2003).

data. Hall (1997) does not find a statistically significant impact of educational homogamy (schooling degree) on risk of divorce, whereas Kopp (2000) shows that homogamy with respect to schooling degree increases marital stability but with respect to vocational and university degree it has no effect. Both use data from the Mannheim divorce study but different samples.[9] Koch (1993) looks for these patterns using data from the first five SOEP-waves from 1984 to 1988. She analyzes divorce probabilities for marriages already existing in 1984. She finds that the difference in education does not affect marital stability. However, couples in her sample are not observed from the beginning of their marriage on so that the sample may consist of relatively stable couples having already mastered their first years of marriage. Moreover, all studies mentioned so far do not distinguish between different levels of education which, given empirical findings for the US, probably makes a difference. Only Wagner (1997) differentiates between three hierarchical levels in his analysis for West and East Germany with data from the German Life History Study. He does not find any general evidence for a stabilizing impact of educational homogamy. However, his results are based only on a sample of couples from birth cohorts 1919–1921.

The impact of religion seems to be clearer. A stabilizing effect if two spouses have the same religious denomination can be found in e.g. Charles and Stephens (2004), Bumpass et al. (1991), and Bumpass and Sweet (1972) for US-couples. However, for European countries, less research has been done on this topic. Kalmijn et al. (2005) find for the Netherlands that couples with only one unaffiliated spouse do not have a higher risk of divorce than homogamously unaffiliated marriages. To our knowledge, no study exists that explicitly look for the effect of dissimilarities in religious behavior for Germany. Wagner (1997) and Diekmann and Klein (1991) find that people without denomination have a higher divorce probability than people with denomination. Müller (2003) finds the opposite. However, they all do not look for the impact of religious homogamy. Only Hall (1997) includes a dummy variable if both spouses go to the church at least once a month compared to all other possible combinations. She finds a stabilizing effect.

4.4 Empirical approach

4.4.1 Complementary log-log model

The focus of our analysis is on the impact of certain explanatory variables on the conditional probability of getting divorced, i.e. the probability of getting

[9] For example, Kopp (2000) includes also couples wedded in the former GDR.

divorced in time interval t given that the couple has not separated until then. In most cases a proportional hazard model like the Cox model is used for these kind of questions. However, given the data we use, discrete-time models are better suited since they do not rely on the assumption that at most one transition per period occurs. Several authors have considered the discrete-time variant of the continuous proportional hazard model (e.g. Kiefer, 1988; Meyer, 1990). However, we follow an alternative approach and use a binary choice model. Duration data models and models for binary choice are closely related. The hazard function as the rate of leaving the initial state during a period can also be interpreted as the probability to observe a specific binary outcome. Sueyoshi (1995) shows that the popular logit and probit models with period-specific dummy variables yield similar results to the discrete-time proportional hazard model. In fact, the complementary log-log model (cloglog) is perfectly equivalent to it (Cameron and Trivedi, 2005) and therefore, we apply this approach.
The discrete time hazard function λ_j is the probability of transition (exit) at discrete time t_j, $j = 1, 2, \ldots$, given survival to time t_j:

$$\lambda_j = Pr(t_{j-1} \leq T < t_j | T \geq t_{j-1}).$$

The survivor function is the probability of staying in the same state until t and is obtained recursively from the hazard function as

$$S(t) = Pr(T \geq t) = \prod_{j=1}^{t} [1 - \lambda_j].$$

The natural parametric starting point is the exponential as a Poisson process has durations that are exponentially distributed. The exponential duration model has a constant hazard rate that does not vary with t. This distribution has been regarded as being too restrictive in practice and as an alternative the complementary log-log model has been proposed. It is based on the type 1 extreme value distribution which is asymmetric in contrast to the logistic or standard normal distribution of the logit and probit model, respectively. This asymmetry makes cloglog models superior for the analysis of rare events like divorce. The cloglog hazard function for observation i in period j is:

$$\lambda_j(t_j | x_i) = 1 - \exp(-\exp[\ln \lambda_{0j} + x_i' \beta]),$$

where λ_0 is called the baseline hazard.
It is well established in the literature on duration data that neglecting unobserved heterogeneity leads to biased results (see Heckman and Singer, 1984; Lancaster, 1990). One solution is the introduction of a random variable ν_i into the hazard

specification by so-called mixture models. The heterogeneity term is assumed to be time-invariant and independently distributed of x. The complementary log-log model is then given by:

$$\lambda_j(t_j|x_i) = 1 - \exp(-\exp[\ln \lambda_{0j} + x_i'\beta + \nu_i]).$$

Conditional on ν_i, the individual densities are the probabilities to leave a certain status for each observation computed at $x_{it}'\beta + \nu_i$, which is just a general model for random effects within a binary choice framework. Butler and Moffit (1982) propose to integrate out the random component. The discrete-time likelihood function that incorporates the unobserved heterogeneity term is then obtained by summing up the discrete-time likelihood functions of each individual i which is given by

$$L_i = \int_{-\infty}^{\infty} \prod_{t=1}^{T_i} [F(y_{it}, x_{it}'\beta + \nu_i)]^{y_{it}} \, [1 - F(y_{it}, x_{it}'\beta + \nu_i)]^{1-y_{it}} \, g_\nu \, d\nu_i.$$

g_ν is the density of the unobserved heterogeneity term. In case of the probit model Butler and Moffit (1982) posit the straightforward assumption of a normally distributed term which leads to:

$$L_i = \int_{-\infty}^{\infty} \frac{e^{-\nu_i^2/2\sigma_\nu^2}}{\sqrt{2\pi}\sigma_\nu} \prod_{t=1}^{T_i} [F(y_{it}, x_{it}'\beta + \nu_i)]^{y_{it}} [1 - F(y_{it}, x_{it}'\beta + \nu_i)]^{1-y_{it}} \, d\nu_i.$$

We follow this idea and also assume a random effect ν_i with distribution $N(0, \sigma_\nu^2)$ in our complementary log-log model. Its integral is approximated by using adaptive Gauss-Hermite quadrature with 20 quadrature points. Refitting the model with different numbers of quadrature points did not yield any substantial changes in the results[10] Nicoletti and Rondinelli (2006) show that the results of complementary log-log models are robust to a possible misspecification of the distribution of the unobserved heterogeneity component.

4.4.2 Sample

We use data for West German couples provided by the SOEP from 1984 to 2007. It is possible to identify the time period when a marriage has begun and hence, we are able to account for the length of marriage. Couples are observed until separation or divorce (whichever is stated first) or until observations are right-censored. In the following, we do not distinguish between separation and divorce

[10] For more details about the approximation method, see e.g. Liu and Pierce (1994) or in the context of random effects logit models, see Rabe-Hesketh and Skrondal (2008).

and use them interchangeably. We restrict our sample to couples where both spouses are in the age range from 18 to 65 at the time of marriage. Moreover, we pool first and later marriages: for 299 husbands (23.34 %) and 306 wives (23.89 %), we observe a second or later marriage. In total, there are 454 couples (35.4 %) in which at least one spouse is not married for the first time. Finally, the sample consists of 1,281 couples with 11,337 couple-years and 284 divorces. Hence, the observed probability of divorce is 2.51 %, and 22.17 % of the couples finally separate.

Figure 4.1: Kaplan-Meier survivor distribution function

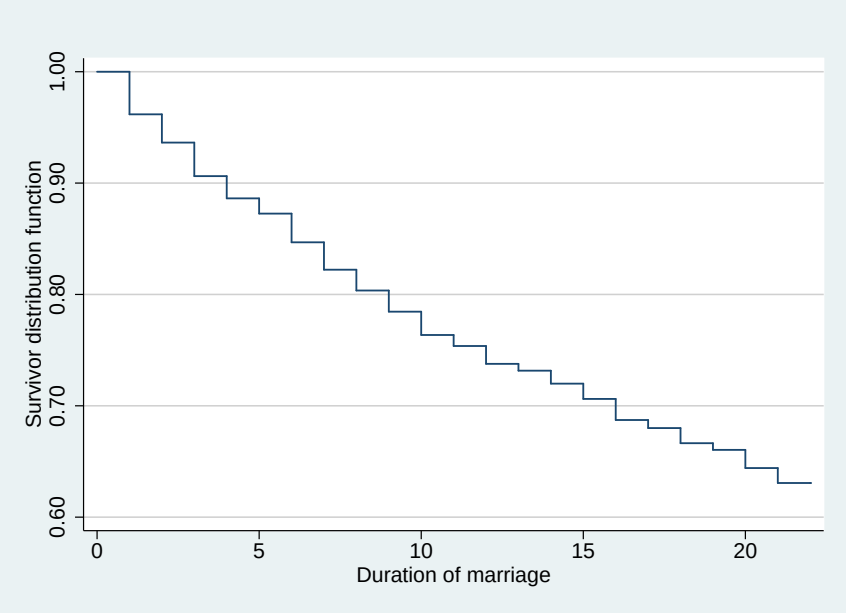


Figure 4.1 illustrates the Kaplan-Meier survivor function for the sample. It estimates the conditional probability of remaining married by period t given that the couple has not separated until t. We see that the probability of remaining married decreases by ten percentage points within the first four years of marriage. It further falls by ten percentage points in the following five years. After a marriage duration of ten years, the probability to stay together is about 76 %. After the maximum observation time of 22 years, the likelihood to stay married is still 63 %.

4.4.3 Explanatory variables

In the following, we explain the definition of the explanatory variables and present some descriptive statistics. Since the effects of education and religious affiliation are of main interest these variables are explained in more detail.

Education

Following Blossfeld and Timm (2003), three hierarchical groups of education are classified:

1. No schooling degree or *Hauptschul-* or *Realschul*-degree, without vocational degree ("Low");
2. No schooling degree or *Hauptschul-* or *Realschul*-degree, but with vocational degree or *Abitur/Fachhochschulreife*, with or without vocational degree ("Medium");
3. University degree or degree of university of applied sciences ("High").

These three levels should reflect the main differences in labor market opportunities and earnings capacities and also regarding their cultural resources (Blossfeld and Timm, 2003). Table 4.1 shows the distribution of educational levels at the beginning of the marriage for husbands and wives separately. The great majority of both sexes have medium education, 71 % of husbands and 73 % of wives. The percentage of husbands with a high educational level at the time of marriage is, however, much higher than for wives, 18 % compared to 11 %.

Table 4.1: Distribution of educational level at the time of marriage

Educ.	Husbands		Wives	
level	No.	%	No.	%
Low	135	10.54	196	15.30
Medium	913	71.27	939	73.30
High	233	18.19	146	11.40
Total	1,281	100.00	1,281	100.00

Table 4.2 shows the distribution of the stated educational levels in each sample year, not only at the beginning of the marriage. The first part gives the number of husbands/wives stating the respective educational level in their last sample year. The second part presents the total number of observations where the husband/wife reports it. A comparison with Table 4.1 reveals slight shifts towards higher education. Hence, some individuals in the sample attain a higher educational level during the observation period by finishing their vocational training or studies at university. For example, the percentage of highly educated husbands rises to 22.1 % and to 12.6 % for wives. For the regressions, only the

period-specific educational levels are used. Additional estimations using the educational levels at the time of marriage have shown, however, that the results are not substantially altered.[11]

Table 4.2: Distribution of period-specific educational level

Educ.	Husbands				Wives			
level	No.	%	Obs.	%	No.	%	Obs.	%
Low	126	9.84	1,010	8.90	184	14.36	1,623	14.32
Med.	872	68.07	8,048	70.99	936	73.07	8,488	74.87
High	283	22.09	2,279	20.10	161	12.57	1,226	10.81
Total	1,281	100.00	11,337	100.00	1,281	100.00	11,337	100.00

Number of husbands and wives refer to stated education in their last sample year.

Table 4.3: Distribution of period-specific educational combinations

Husband's	Wife's education			
education	Low	Medium	High	Total
Low	340	653	17	1,010
	(47)	(76)	(3)	(126)
Medium	1,214	6,529	306	8,048
	(134)	(694)	(44)	(872)
High	69	1,307	903	2,279
	(3)	(166)	(114)	(283)
Total	1,623	8,488	1,226	11,337
	(184)	(936)	(161)	(1,281)

First row shows total number of observations, whereas numbers in parentheses refer to the number of couples as stated in their last sample year.

Based on these three educational groups, we first define nine possible spousal combinations of education. Table 4.3 illustrates the distribution of period-specific educational combinations. It can be seen that educational homogamy is most common with a high proportion of two medium-educated partners (54 %). For less than 10 % of the couples we observe a higher educated wife. Spouses with strongly divergent education are even less common: only three couples consist of a low-educated wife and a high-educated husband and vice versa. However, these small numbers make regression analysis problematic and therefore, we assign these couples to those with one low-educated and one medium-educated spouse. Thus, in these cases, we group high-educated spouses with medium-educated ones. Alternatively, the low-educated partner could be combined with his or her

[11] Due to the facilitated access to higher education in recent decades (in particular for women) we expect differences in the educational composition across cohorts. In Appendix 4.7.2, we present some facts concerning this issue for our sample.

medium-educated peers. However, given inherent labor market opportunities, equating medium- and high-educated people are, in our opinion, less questionable than merging low- and medium-educated individuals. Ultimately, we only distinguish between seven spousal combinations of education.

Religion

As indicator for religiousness, we use the question whether the individual attended church services or other religious events. It has been shown for the US that church attendance is a superior indicator for religious affiliation than denomination and is more likely to affect marital stability (see e.g. Heaton, 1984).[12] For our analysis, we generated a dummy variable "No church attendance" for each spouse that takes the value one if someone never attended church services and zero if someone did so every week, every month or less frequently. For data reasons, we do not distinguish between different types of religion.

Table 4.4: Distribution of church attendance

	Husband	Wife
Yes	5,907	6,850
	(52.10)	(60.42)
No	5,430	4,487
	(47.90)	(39.58)
Total	11,337	11,337

Percentages in parentheses.

Table 4.4 shows the distribution of the variable for wives and husbands. We see that the majority state participation in religious activities, at least occasionally. It becomes also clear that wives are slightly more involved than husbands: 60 % of wives compared to 52 % of husbands went to church services or other religious events.
In order to estimate the impact of homogamy, four groups are defined:

1. Both spouses attended church services or other religious events.
2. Both spouses did not attend.
3. Only the wife attended.
4. Only the husband attended.

[12] Both questions are not asked every year but for church attendance more frequently. For these years in which the question is not asked, preceding information is carried over.

Table 4.5 illustrates the spousal combinations in our sample. We find a predominance of couples with two spouses who went to religious events. Couples with a participating husband and a non-participating wife are rather uncommon.

Table 4.5: Distribution of spousal combinations of church attendance

Church attend. husband	Church attend. wife Yes	No	Total
Yes	5,081	826	5,907
	(44.82)	(7.29)	(52.10)
No	1,769	3,661	5,430
	(15.60)	(32.29)	(47.90)
Total	6,850	4,487	11,337
	(60.42)	(39.58)	(100.00)

Percentages in parentheses.

Additional explanatory variables

In addition to education and religion variables, we control for several other factors that potentially influence the risk of divorce. Some of them are correlated with our covariates of main interest. Table 4.9 in Appendix 4.7.1 summarizes descriptive statistics of the variables used in our regressions (except education and religion).

Age at marriage is one of the most important explanatory variables in previous studies of marital stability. Nevertheless, it is also correlated with education. Spouses with an academic degree tend to marry at a later age than others.[13] Other factors related to both education and risk of divorce are income and unemployment. For our analysis, the former is specified as the household's total net income and the latter as the cumulated number of months in this state in the past.

Another aspect of homogamy between two spouses is the age difference. We define it as the absolute difference between husband and wife, irrespective of who is the older one. Similar to educational or religious homogamy, being of a similar age should stabilize the relationship between two spouses.[14] In order to test the hypothesis that urban life increases the risk of divorce because of the higher

[13] See Appendix 4.7.3 for more details about the relationship between education and age at marriage in our sample.

[14] Various other specifications of the model that distinguish between an older husband and an older wife as well as between different degrees of the age difference neither provide evidence for a gender-specific difference nor for a non-linear impact.

probability to meet a better match, we include a dummy variable for living in the city center. In contrast, children living in the household are expected to stabilize a marriage. We distinguish between children of different ages, namely age 0–1, 2–7, and 8–15. However, we do not differentiate between own children, adoptive children and children from previous relationships. Additional controls are a dummy variable for a later marriage of at least one spouse, year of birth[15], and marriage duration dummies. Whether first or later marriages are more stable is a priori not clear. On the one hand, people have gained more experience if they marry for the second time. On the other hand, people who marry several times are maybe a selection of individuals that are in general quite unstable and revise all their decisions more often.

All the variables mentioned so far are in each case measured in the period prior to the potential divorce. Thus, we estimate $Pr(y_{it} \neq 0|x_{i,t-1})$. However, we deviate from this definition in the case of labor supply. Working behavior is an important potential risk factor of marital stability. It increases the financial independence as well as the opportunity to meet candidates for better suited matches. Moreover, it is correlated with education. In order to separate the direct influence of education on the risk of divorce and the indirect effect via labor supply, it is necessary to control for hours worked. Labor market behavior can, however, be largely influenced by the subjective probability of divorce (see Johnson and Skinner, 1986). We expect a change in hours worked in the preceding years to divorce, in particular by women to become financially more independent. This would then be, however, a case of reversed causality which would bias our estimates. For that reason, we use hours worked of period $t-3$ instead of $t-1$ in order to circumvent this problem.[16]

4.5 Results

Tables 4.6 and 4.7 present average marginal effects. In case of continuous variables, we show partial derivatives, whereas for dummy variables, the change in the predicted probability of divorce due to the discrete change from zero to one is shown. The effects seem to be quite small. However, relative to the predicted probability of divorce of 0.025 per year many are quite substantial.
Section 4.5.1 illustrates estimation results if individual education and church attendance behavior are included. The impact of spousal combinations follows in Section 4.5.2. Tables 4.6 and 4.7 also include the likelihood-ratio (LR) test

[15] Replacing them by dummies of groups of cohorts did not alter the regression results.

[16] Results are, nevertheless, robust to the definition of hours worked. See Appendix 4.7.4 for more details.

statistic for the hypothesis that the proportion of the total variance that is contributed by the panel-level variance, ρ, equals zero. If ρ is zero the random effects estimator does not differ significantly from the pooled estimator. However, the hypothesis can be rejected on a 5 % significance level.

4.5.1 Effects of individual education and church attendance

In the following, we will first briefly describe the results for the other explanatory variables before interpreting the effects of the variables of most interest.
In our estimation, the dummy variable for a later marriage does not show any significant effect on the probability of divorce. This also holds for the age at marriage (and year of birth) variables. Maybe, the non-significance of these covariates reflects a compensation of the stabilizing effect of a high age at marriage per se by the destabilizing effect of a later marriage which, however, also usually involves a higher age. In contrast, age homogamy has the expected stabilizing effect. Children as marriage-specific investments are also supposed to stabilize a relationship. Our results suggest that the effect depends on the age of children. We find a negative effect on the risk of divorce for newly born but not for children in general. The number of children in the age range from 8 to 15 even raises significantly the probability of separation. Maybe spouses do not stay together just for the sake of the children if those have reached a certain age. City life lowers, as expected, marital stability considerably.

Household's net income, a factor related to education, has a positive but not significant impact on the risk of divorce. Concerning working hours and the effect of unemployment, we find gender-specific differences. On the one hand, husband's hours worked do not alter the likelihood of separation, whereas wife's hours worked (weakly) destabilize a relationship. On the other hand, husband's unemployment lowers significantly marital stability. In contrast, if the wife loses her job the risk of divorce is not significantly affected.[17] Thus, only husband's employment seems to contribute to the gains from marriage, not the wife's.

However, of most interest is the effect of individual church attendance and education. We expect religious people to have a more stable relationship, whereas the effect of education is not clear a priori. On the one hand, high education improves outside options and makes specialization less advantageous. On the other hand, high-educated individuals are likely better able to form expectations and have therefore a lower risk to become disappointed. In fact, we do find that couples with a religious husband have a lower probability of separation. Wife's

[17] These results confirm an earlier study of Kraft (2001) about the effect of unemployment on the risk of separation.

Table 4.6: Average marginal effects I

	(1)
H: High-educated	-0.0092**
H: Medium-educated	-0.0071*
W: High-educated	-0.0080**
W: Medium-educated	-0.0099***
H: No church att.	0.0103***
W: No church att.	0.0033
Not first marriage	-0.0019
H: Age at marriage	-0.0007
W: Age at marriage	0.0003
Absolute age difference	0.0009**
H: Year of birth	-0.0002
W: Year of birth	0.0004
No. of HH members age 0–1	-0.0129**
No. of HH members age 2–7	-0.0001
No. of HH members age 8–15	0.0065***
Live in City	0.0124**
HH net income	0.0016
H: Hours worked t-3	-0.0001
W: Hours worked t-3	0.0001*
H: No. months in UE cum.	0.0002***
W: No. months in UE cum.	0.0001
Rho	0.34589
p-value $H_0 : Rho = 0$	0.025
Chi2	119.82

1) *: p<0.10, **: p<0.05, ***: p<0.01; St.Err. computed by the delta method.
2) "H:" stands for husbands, "W:" for wives, "HH" for household.
3) Reference group: low education.
4) Effects for duration dummies not presented.

behavior has no effect in this respect. Concerning education, our results suggest that the aspect of expectation forming dominates. Medium- and high-educated people have a lower risk of divorce than low-educated ones. The effects are also approximately the same for husband's and wife's education. Thus, despite of the gender-specific differences with respect to unemployment and hours worked, we do not find them with respect to education.

4.5.2 Effects of spousal combinations

Table 4.7 illustrates the influence of spousal combinations of education and church attendance.[18] The first six rows show the education dummies. The first letter stands for the husband's and the second letter for the wife's education. In general, we do not find evidence for a stabilizing impact of homogamy neither concerning education nor concerning religion.

Table 4.7: Average marginal effects II (Extract)

	(2)
H – H	-0.0163***
M – M	-0.0239***
H/M – L	-0.0114***
H – M	-0.0168***
M – H	-0.0132***
L – H/M	-0.0129***
Both no church att.	0.0166***
Only H church	0.0138*
Only W church	0.0192***
Rho	0.31818
p-value $H_0 : Rho = 0$	0.037
Chi2	124.79

1) First six rows refer to education. First letter stands for husband's, second for wife's. "H" denotes high education, "M" medium, and "L" low.
2) Reference groups: both low-educated; both go to church.

Even though we observe the highest decrease in risk of dissolution for homogamous medium-educated mates, couples with two low-educated spouses (the reference group) have a significantly higher probability of divorce than any other combination. The smallest changes can be found for the combinations with one low-educated spouse. Hence, our results suggest that not the combination of

[18] The results for the other control variables do not substantially differ from the first estimation. Therefore, we do not present them here.

education but low versus medium and high education matters. Spouses with a low educational level exhibit higher divorce risks than spouses with medium or high education. This supports our previous findings with respect to the impact of individual education, however, the significance is now much higher. In contrast to Charles and Stephens (2004), we do not find evidence that it matters *who* has a higher education attainment level. Regressions with alternating reference groups neither yield significant differences between "H–M" and "M–H" nor between "H/M–L" and "L–H/M".[19]

Church attendance of both spouses has the expected stabilizing effect. Each of the three other combinations has a substantially higher probability of dissolution. However, couples with two non-attending spouses do not have a significantly lower divorce risk than couples where only one spouse goes to religious events (see Table 4.8 for results with different reference groups). Thus, as in the case of education, homogamy itself does not stabilize the relationship but religiousness versus non-religiousness. One possible explanation could be that sharing leisure time together is inherent in our variable "Both attended church service". This might reduce the probability of separation. Moreover, religiousness itself seems to matter because it implies a high valuation to be married by both spouses rather than similarity in this attitude.
Even though the destabilizing effect is higher if only the wife attends church service than if only the husband does so, we do not find a significant difference between the two groups in the direct comparisons (3a) and (4a). Hence, as for education and in contrast to the results for individual church attendance, we do not observe gender-specific differences.

Table 4.8: Effect of reference group regarding church attendance (Extract)

	(1a)	(2a)	(3a)	(4a)
Both no church att.	0.0166***		0.0040	0.0001
Both church att.		-0.0135***	-0.0100***	-0.0134***
Only H church	0.0138*	-0.0037		-0.0036
Only W church	0.0192***	-0.0001	0.0041	

4.6 Conclusion

In our analysis, we test the hypothesis that homogamy increases marital stability. Becker (1973) assumes that earnings capacities should be dissimilar but traits like intelligence, age, religion, and education (apart from its impact on wage earnings capacity) should be positively correlated.

[19] Results are not presented.

We place an emphasis on education and religiousness measured by attendance of church services and other religious events. The effect of education is not clear from the theoretical point of view because of its effect on the wage earnings capacity. Consequently, an empirical test is necessary to get a better understanding about its impact on marital stability. In contrast, religious affiliation expresses, among others, views concerning the importance of marriage. How disharmony in this respect affects the risk of dissolution is important to know since religion can be interpreted as a proxy for other attitudes and preferences in general. As we have information for both spouses about their church attendance behavior we can test for the effects of similarity and dissimilarity of preferences.

Using a large German household panel data set, we estimate the probability of divorce with complementary log-log models considering unobserved heterogeneity. We find that spouses who are similar to each other normally do not have a lower risk of divorce than dissimilar spouses. Only for age we find a stabilizing effect: the risk of divorce increases with increasing age difference. In contrast, a stabilizing effect with respect to education and church attendance can only be found for certain groups like couples with two medium- or two high-educated spouses, or if both attend religious events. Our results suggest that not the combination matters but low versus medium or high education and church attendance of both spouses versus no church attendance of at least one spouse. Spouses with a low educational level and couples without religious affiliation realize significantly higher divorce risks. Therefore, other aspects of these characteristics and activities seem to play an important role. Examples are sharing leisure time together or the ability to form expectations.

So far, we have neglected important financial aspects in addition to household's total net income. It is, nevertheless, very likely that not only hours worked but the associated individual wage as well as non-labor income and property influence the success of a relationship. Thus, future research should take these factors into account.

4.7 Appendix

4.7.1 Descriptive statistics

Table 4.9: Descriptive statistics of explanatory variables

Variable	Mean	Std. Dev.
For at least one spouse not first marriage	0.35	0.48
H: Age at marriage	32.19	8.28
W: Age at marriage	29.43	7.43
Absolute age difference	4.06	3.98
H: Year of birth	1960	9.05
W: Year of birth	1962	8.17
Live in city center	0.09	0.28
No. of HH members age 0–1	0.14	0.36
No. of HH members age 2–7	0.57	0.75
No. of HH members age 8–15	0.39	0.71
HH's net income in 1,000 Euro of 2000	2.64	1.30
H: Cum. number of months in UE	5.41	14.52
W: Cum. number of months in UE	5.41	10.75
H: Hours worked (per week) in t-3	40.13	14.19
W: Hours worked (per week) in t-3	19.41	17.51
Total no. of observations	11,337	100.00

1)"H:" stands for husbands, "W:" for wives, "HH" for household, "UE" for unemployment.
2) All variables refer to period t-1 except hours worked.

4.7.2 Changes in education across cohorts

The sample distribution of birth cohorts ranges from the 1920s to the 1980s. Since younger cohorts (in particular of women) have had a much easier access to higher education, we expect changes in the educational attainment of married men and women across cohorts (see Tables 4.10 and 4.11).

A trend can only be found for the medium-educated husbands and wives. Their fractions increase over cohorts (except 1950s cohorts for husbands) and at the same time, the proportion of those with *Abitur* grows steadily. The percentage of low-educated husbands is slightly smaller for 1960–1984 cohorts than for the pre-1950 cohorts. Around 20 % of all husbands have a university degree. However, this proportion is substantially higher for the 1950s cohorts (29 %) and smaller for the most recent cohorts (16 %). The latter probably reflects that high-educated individuals defer marriage to a later age and are, therefore, underrepresented in our youngest cohorts (see 4.7.3 for more details).
As expected, changes are more obvious for women. The fraction of wives with low education is substantially smaller for post-1950 cohorts compared to the

Table 4.10: Distribution of husbands' education by birth cohort

Husband's education	Husband's birth cohort 1920–49	1950–59	1960–69	1970–84	Total
Low	18	20	68	20	126
	(11.84)	(7.72)	(10.00)	(10.53)	(9.84)
Medium	102	165	466	139	872
	(67.11)	(63.71)	(68.53)	(73.16)	(68.07)
of which with Abitur	*11*	*28*	*84*	*31*	*154*
	(10.78)	*(16.70)*	*(18.03)*	*(22.30)*	*(17.66)*
High	32	74	146	31	283
	(21.06)	(28.57)	(21.47)	(16.32)	(22.09)
Total	152	259	680	190	1,281
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

1)Percentages in parentheses.

2) Figures refer to stated education in the last sample year.

Table 4.11: Distribution of wives' education by birth cohort

Wife's education	Wife's birth cohort 1927–49	1950–59	1960–69	1970–85	Total
Low	23	21	93	47	184
	(28.75)	(10.14)	(13.84)	(14.60)	(14.36)
Medium	49	149	494	244	936
	(61.25)	(71.98)	(73.51)	(75.58)	(73.07)
of which with Abitur	*1*	*16*	*108*	*62*	*187*
	(2.04)	*(10.74)*	*(21.86)*	*(25.11)*	*(19.98)*
High	8	37	85	31	161
	(10.00)	(17.87)	(12.65)	(9.63)	(12.57)
Total	80	207	672	322	1,281
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

1) Percentages in parentheses.

2) Figures refer to stated education in the last sample year.

proportion of 29 % in cohorts born before 1950. In contrast, highly educated wives are more common among the cohorts from 1950 to 1969 than among the pre-1950 and most recent cohorts from 1970 to 1985. Again, the latter probably reflects the higher age at marriage and, in addition, a recent increase of never-married women among the highly educated (Schwarz, 1999).

Table 4.12: Distribution of educational combinations by wives' birth cohort

	Wife's birth cohort				
	1927–49	1950–59	1960–69	1970–85	Total
Both have same educ.	50	135	446	224	855
	(62.50)	(65.22)	(66.37)	(69.57)	(66.74)
Husb. higher educ.	21	53	162	67	303
	(26.25)	(25.60)	(24.11)	(20.81)	(23.65)
Wife higher educ.	9	19	64	31	123
	(11.25)	(9.18)	(9.50)	(9.63)	(9.60)
Total	80	207	672	322	1,281
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

1) Percentages in parentheses.
2) Figures refer to stated education in the last sample year.

Table 4.12 illustrates the predominance of educational homogamy over (wives') cohorts. The proportion of homogamous couples has increased steadily, whereas couples with a higher educated husband have become much less common. In spite of the relatively high percentage of high-educated wives among the cohorts from 1950 to 1969, the fraction of couples with a higher educated wife has not increased. The latter confirms results by Blossfeld and Timm (2003) who have found that the percentage of women who married less qualified men has been small and fairly constant across cohorts. The increasing educational attainment of women from younger cohorts have not changed this pattern. Blossfeld and Timm (2003) argue that for women, the social and interactional pressure to marry upwardly or at least homogamously still exist. As a consequence, high-educated women prefer not to marry at all instead of marrying a lower qualified man.

4.7.3 Education and age at marriage

Tables 4.13 and 4.14 give an overview of the mean age at marriage by educational level and type of marriage (first or later). For first marriages, we see that women are usually one to three years younger than men given their educational level. For later marriages, however, the difference in the mean age between high-educated husbands and wives is less than one year, whereas the difference between medium- and low-educated ones is about four to five years.

Moreover, it can be seen that the timing of first marriage is deferred the longer someone stays in the educational system. On average, men with a university degree marry for the first time aged 34, whereas men with low education marry aged 28. Similarly, wives with a university degree marry for the first time at age 32, whereas low-educated women are around 26 years old. However, one has to consider that some of the low- and medium-educated persons have not finished their training or studies at the time of marriage and thus, switch to higher-educated groups during marriage. The ascending age with ascending education can also be found for women's later marriages. In contrast, husbands' age at later marriage is around 40 years, independent of educational attainment.

Table 4.13: Distribution of husband's age at marriage by educational level

Husb.'s	First marr.			Later marr.			All		
educ.	Mean	St.d.	No.	Mean	St.d.	No.	Mean	St.d.	No.
Low	28.26	5.51	94	39.95	10.21	41	31.81	9.02	135
Medium	30.65	6.95	701	39.82	9.73	212	32.78	8.60	913
High	33.75	6.05	187	41.07	9.89	46	35.19	7.54	233
All	31.01	6.83	982	40.03	9.80	299	33.12	8.52	1,281

Table 4.14: Distribution of wife's age at marriage by educational level

Wife's	First marr.			Later marr.			All		
educ.	Mean	St.d.	No.	Mean	St.d.	No.	Mean	St.d.	No.
Low	26.05	7.10	132	34.89	10.22	64	28.93	9.21	196
Medium	28.03	5.57	719	35.97	9.01	220	29.89	7.35	939
High	32.35	5.40	124	40.68	8.57	22	33.61	6.66	146
All	28.31	6.01	975	36.08	9.32	306	30.17	7.69	1,281

4.7.4 Definition of hours worked

Figures 4.2 and 4.3 show the development of average hours worked in the years preceding divorce. The figures for divorced wives and divorced husbands refer to the average hours worked of those couples that eventually divorce, but while they are still married. The short-dashed lines give the mean of all female and male observations, respectively.

It becomes obvious that wives and husbands that eventually divorce work generally more on average than the pool of all wives and husbands. However, the difference is almost negligible for husbands. For both sexes, we observe a change in working behavior prior to divorce. Husbands work less while wives widen their

Figure 4.2: Means of husbands' hours worked in years prior to divorce

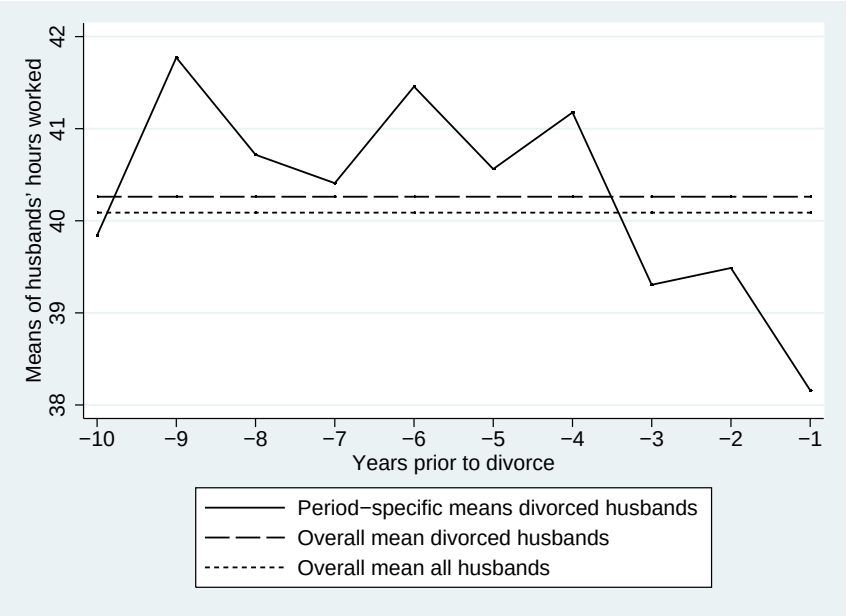
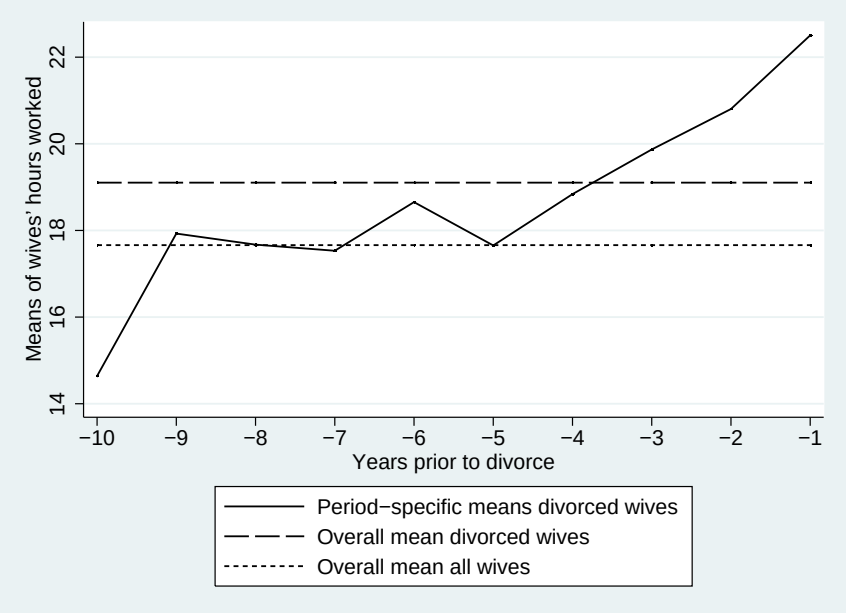


Figure 4.3: Means of wives' hours worked in years prior to divorce



labor supply. In either case, the period-specific mean crosses the average of the divorced between $t-4$ and $t-3$. Therefore, we use data of $t-3$ for our regressions to diminish the endogeneity problem.

Nevertheless, we tested the effect of the definition of hours worked on our variables of interest. Tables 4.15 and 4.16 compare the marginal effects of random effects estimations if hours worked of different periods from $t-1$ to $t-5$ are used. We can see that the results are only slightly affected by the definition of hours worked. Not surprisingly, the biggest changes can be observed for the effects of children. The impact of new-born children in $t-1$ is insignificant if hours worked of period $t-1$ is included. With labor supply of later periods, the effect becomes larger and significant. Apparently, this children variable captures partly the effect of a non-working wife in period $t-1$.

Table 4.15: Effect of definition of hours worked on RE estimations I

	(1b)	(2b)	(3b)	(4b)	(5b)
Not first marriage	-0.0020	-0.0020	-0.0019	-0.0018	-0.0017
H: Age at marriage	-0.0005	-0.0005	-0.0007	-0.0006	-0.0006
W: Age at marriage	0.0003	0.0003	0.0003	0.0003	0.0003
Absolute age difference	0.0009**	0.0009**	0.0009**	0.0009**	0.0009**
H: Year of birth	-0.0001	-0.0002	-0.0002	-0.0002	-0.0002
W: Year of birth	0.0003	0.0003	0.0004	0.0003	0.0003
No. of HH mem. 0–1	-0.0078	-0.0115**	-0.0129**	-0.0128**	-0.0129**
No. of HH mem. 2–7	0.0007	0.0007	-0.0001	-0.0013	-0.0019
No. of HH mem. 8–15	0.0067***	0.0063***	0.0065***	0.0059**	0.0055**
Live in City	0.0120**	0.0121**	0.0124**	0.0126**	0.0127**
HH net income	0.0012	0.0010	0.0016	0.0015	0.0015
H: High-educated	-0.0082**	-0.0089**	-0.0092**	-0.0091**	-0.0090**
H: Medium-educated	-0.0065*	-0.0071*	-0.0071*	-0.0069*	-0.0066*
W: High-educated	-0.0088**	-0.0083**	-0.0080**	-0.0077*	-0.0077*
W: Medium-educated	-0.0102***	-0.0100***	-0.0099***	-0.0094***	-0.0093***
H: No church att.	0.0099**	0.0100***	0.0103***	0.0103***	0.0104***
W: No church att.	0.0035	0.0032	0.0033	0.0033	0.0034
H: No. months in UE cum.	0.0002***	0.0002***	0.0002***	0.0003***	0.0003***
W: No. months in UE cum.	0.0001	0.0001	0.0001	0.0001	0.0001
H: Hours worked t-1	-0.0001				
W: Hours worked t-1	0.0002***				
H: Hours worked t-2		0.0001			
W: Hours worked t-2		0.0002**			
H: Hours worked t-3			-0.0001		
W: Hours worked t-3			0.0001*		
H: Hours worked t-4				0.0001	
W: Hours worked t-4				0.0001	
H: Hours worked t-5					0.0001
W: Hours worked t-5					-0.0001
Rho	0.36503	0.38060	0.34589	0.35017	0.34674
p-value $H_0 : Rho = 0$	0.019	0.015	0.025	0.026	0.028
Chi2	120.76	115.74	119.82	113.83	114.43

1) Table shows marginal effects computed at the mean of each covariate except for dummies.
2) *: p<0.10, **: p<0.05, ***: p<0.01; st.err. computed by the delta method.
3) "H:" stands for husbands, "W:" for wives, "HH" for household.

Table 4.16: Effect of definition of hours worked on RE estimations II (Extract)

	(1c)	(2c)	(3c)	(4c)	(5c)
H – H	-0.0161***	-0.0161***	-0.0163***	-0.0157***	-0.0154***
M – M	-0.0234***	-0.0238***	-0.0239***	-0.0223***	-0.0215***
H/M – L	-0.0109***	-0.0111***	-0.0114***	-0.0106***	-0.0102**
H – M	-0.0162***	-0.0164***	-0.0168***	-0.0163***	-0.0160***
M – H	-0.0136***	-0.0133***	-0.0132***	-0.0128***	-0.0127***
L – H/M	-0.0129***	-0.0126***	-0.0129***	-0.0121***	-0.0118***
Both no church att.	0.0164***	0.0160***	0.0166***	0.0166***	0.0169***
Only H church	0.0142*	0.0135*	0.0138*	0.0141*	0.0143*
Only W church	0.0187***	0.0186***	0.0192***	0.0193***	0.0195***
H: Hours worked t-1	-0.0001				
W: Hours worked t-1	0.0002***				
H: Hours worked t-2		0.0001			
W: Hours worked t-2		0.0002**			
H: Hours worked t-3			-0.0002*		
W: Hours worked t-3			0.0001*		
H: Hours worked t-4				0.0001	
W: Hours worked t-4				0.0001	
H: Hours worked t-5					0.0001
W: Hours worked t-5					-0.0001
Rho	0.33659	0.35570	0.31812	0.32711	0.32493
p-value $H_0 : Rho = 0$	0.029	0.022	0.037	0.036	0.038
Chi2	125.74	120.19	124.79	117.89	118.26

1) Table shows average marginal effects.
2) *: p<0.10, **: p<0.05, ***: p<0.01; st.err. computed by the delta method.
3) "H:" stands for husbands, "W:" for wives.
4) First six rows refer to education. First letter stands for husband's, second for wife's. "H" denotes high education, "M" medium, and "L" low.

Chapter 5

Effect of labor division between wife and husband on the risk of divorce: Evidence from German data[1]

[1]This chapter is based on the IZA Discussion Paper No. 4515 of the same title, co-authored by Kornelius Kraft.

5.1 Introduction

In the last decades, most developed countries were characterized by substantial increases in divorce rates and in labor force participation rates of married women. The extent to which these two developments are related has widely been ignored by economists. However, Becker et al. (1977) already suggest a positive relationship between female labor force participation and risk of divorce in their work on marital stability. Their analysis is based on Becker's theory of marriage (Becker, 1973, 1974a) that hypothesizes that specialization of the two spouses in housework on the one hand and market work on the other hand constitutes the most important factor to gains from marriage compared to staying single. Therefore, the one with the higher wage earnings capacity should specialize in market work, whereas the other one should specialize in doing housework. Due to their higher gains from marriage, these specialized couples should consequently have a lower risk of divorce than couples where both spouses are employed.
In theory, it should not matter whether the husband or the wife participates in the labor force as long as he or she is able to derive a higher wage income. Nevertheless, the breadwinner role is usually assigned to the husband. One reason is probably that, on average, men still earn more than women. However, despite the high female labor force participation and that egalitarian gender attitudes have become more common today, husbands are also still expected to take on the provider role for his family. Consequently, couples with a husband earning less than the wife are more likely to be frustrated or to be subject to social sanctions which in turn leads to a higher probability of separation. Moreover, while we observe a higher female labor force participation today than in the past, housework is still primarily the wife's domain (see e.g. Bittman et al., 2003; Hersch and Stratton, 1994). If one spouse is exposed to the double burden of domestic and market work, this additional stress and the lack of spouse's support are also very likely to reduce marital stability.
Since the Becker approach implies some strong assumptions, bargaining models have been proposed (e.g. Manser and Brown, 1980; McElroy and Horney, 1981). Usually, the division of household goods is not symmetric but depends on the two spouses' outside options and the relative bargaining power. Both are largely affected by the individual's income.

Our questions of interest are whether the labor division between wife and husband has any impact on marital stability and in what respect. Is specialization really stability-enhancing? If so, can we observe differences between the traditional specialization "housewife, working husband" and the non-traditional "househusband, working wife"? Does the modern equal division imply a higher risk of

separation? Previous empirical analyses are usually restricted to the impact of the wife's income relative to total household income. The first group of studies find a positive relationship between this ratio and the probability of divorce, e.g. Kesselring and Bremmer (2006), or Liu and Vikat (2004). That is, the higher the wife's income proportion, the higher the risk of separation. A second group of analyses does not find any statistically significant effect (e.g. Sayer and Bianchi, 2000). Concerning the behavior of German couples only a few empirical studies exist that are usually limited to the effect of wife's employment status (e.g. Böttcher, 2006; Ott, 1992). However, Hartmann and Beck (1999) find that it also matters whether the wife earns more than the husband, and whether there are conflicts about the division of housework or about time spent together. Stauder (2005) instead concentrates on the effect of the division of market and domestic work after childbirth. He finds that marital stability is only significantly diminished if the wife bears the double burden of market and domestic work.

Using a rich panel data set from the German Socio-Economic Panel (SOEP) from 1984 to 2007, we try to shed new light on these issues. For our analysis of divorce determinants, we use complementary log-log (cloglog) regression models with couple-specific random effects to control for unobserved heterogeneity. Our SOEP sample consists of West German couples only that are observed from the beginning of their marriage onwards until separation or right-censoring. The analyses concentrate on the effects of labor division patterns, nevertheless, various other factors are also considered like the number of children of different ages or education that may influence the risk of divorce as well as labor division patterns. In order to test the effect of specialization, we define the wife's labor income as proportion of total household income on the one hand and her proportion of total time used for housework on the other hand as variables of main interest. To our knowledge, we are the first analyzing jointly both factors of labor division as modeled in Becker's household theory: to earn money and to do housework.
Our results suggest that the labor division can have an effect on the risk of divorce but specialization per se is not stability-enhancing. We rather find gender-specific differences. Couples with a female main earner and a husband doing most of the housework have a substantially higher probability of separation than couples with the traditional male breadwinner/housewife-pattern. Marital stability is also considerably reduced if the wife has to bear the double burden of market and housework which we cannot find if the husband bears it. In contrast, the equal division does not significantly alter the risk of divorce.

The Chapter is structured as follows. Section 5.2 contains a discussion about the theoretical effects of the labor division on the risk of divorce. Section 5.3 gives an overview of the relevant empirical literature. Section 5.4 describes data used,

and in Section 5.5, empirical results are presented. Finally, a conclusion is given in Section 5.6.

5.2 Theoretical discussion on the effects of spousal labor division on marital stability

In the following, we briefly discuss the theoretical effects of the spousal labor division and other factors, like education and children, on the risk of divorce in the context of Gary Becker's household model (Becker, 1973, 1974a; Becker et al., 1977) and bargaining theories.[2]

As already explained in Chapter 4.2.1, Gary Becker's theory of marriage regards the household as a production unit. Household members produce household commodities like children, love or affection with market goods and time of household members as input factors. While a household consisting of two persons allocate market goods and the time of two members to maximize the household's output, a single-person household can only allocate market goods and own time. Rational individuals will only marry when both partners expect a higher utility from being married than from remaining single, thus, if own consumption when being married is higher. Analogously, married couples separate when the expected utility from remaining married falls below the expected utility from divorcing and possibly remarrying. This turnover in expectation may result from negative shocks, for instance, an unpredictable change in the partner's characteristics that may provoke a reconsideration of the marriage decision. Thus, the probability of separation depends on the expected gains from marriage compared to being divorced and the distribution of unanticipated gains/losses from marriage.
Becker places an emphasis on the expected gains from marriage. He assumes that the complementarity of the input factors in household production, namely market goods and time, constitutes the main advantage of being married. Due to complementarity, a couple can gain by specialization. Thus, the spouse with the higher wage earnings capacity should specialize in market work. In this way, the household can buy more market goods. The other one should use the time for home production. Since this specialization gain increases with a higher wage difference between the two spouses, negative assortative mating concerning wage earnings capacity is optimal. Moreover, since labor division makes up the major incentive for partners to remain married in this model, every factor that lowers the gains from specialization also substantially decreases marital stability.
In principle, it should not make a difference whether the wife or the husband

[2]For a more detailed description of the models, see Chapters 4.2.1 and 4.2.2.

focuses on market work. Nevertheless, traditionally, the husband takes on the economic provider role, whereas the wife is mainly responsible for housework. According to Becker's theory, the increase in educational attainment and labor force participation of both unmarried and married women accounts for the rise in divorce rates in the last decades. The growing equalization of men and women makes labor division and consequently marriage less advantageous compared to staying single or getting divorced.

The aspect of preferences concerning the labor division between oneself and the spouse is problematic. Some may still prefer the traditional labor division, others may search for an egalitarian relationship, so that a priori the impact of the chosen labor division is not clear. Moreover, if the choice does not meet the expectations of at least one spouse, because their preferences do not harmonize or because of bad labor market and child care conditions, the gains from marriage are reduced.
The Becker model considers children as marital-specific investments that stabilize a relationship. These commodities increase the gains from marriage since they make divorce more costly and thus, lower the probability that it occurs. Nevertheless, it is often very difficult for wives to re-enter the labor market after childbirth, in particular given the small supply of child care in Germany (see Stauder, 2005). This results in unhappiness for women about the imposed labor division between the husband and herself and thus, increases the risk of separation. In this case, the observed specialization does not lead to a higher marital stability but to the contrary.

Becker (1973) also analyzes optimal sorting with respect to factors other than wage earnings capacity. He concludes that positive assortative mating, i.e. mating of likes, is optimal for all other characteristics that are complements in the production of household commodities. Homogamy with respect to interests, age, height etc. should stabilize a partnership. Moreover, the gains from marriage rise with increasing values of these characteristics.
The effect of education is not clear. A good education of both spouses makes specialization less advantageous. From this point of view, (women's) high education increases the risk of divorce. However, individuals with higher education are probably more intelligent than others. This may improve their ability to form expectations about their spouse and his or her future characteristics. Therefore, they are less likely to become disappointed. Moreover, they may be better able to find a partner suited for lifetime. In both cases, we would observe an inverse relationship between education and risk of divorce. Therefore, an empirical investigation is necessary to check which aspect dominates.

Becker's theory is often criticized, because of the assumptions and/or because of the implications. Models based on bargaining theory try to remedy some of the major objections by providing, for instance, a mechanism by which family behavior is formed from individual preferences (e.g. Manser and Brown, 1980; McElroy and Horney, 1981; Chiappori and Weiss, 2007). However, these models are not easy to test empirically.

Similar to Becker's household theory, the advantage to be married depends on the difference between own consumption if married versus if being divorced. This difference in turn is determined by the relative bargaining power within marriage and the outside options. Own financial means are usually interpreted as important determinant of the relative bargaining power. That is, the higher own wage income relative to the partner, the higher the bargaining power should be. Own income should also raise the threat point so that divorce may be more likely if both spouses work than if one spouse depends economically on the partner. Moreover, the threat point is also affected by the probability of remarriage. Individuals participating in the labor force may be more likely to meet other potential partners than those who focus on housework. On the other hand, if both spouses are employed the family possesses a higher income which in turn may substantially increase own consumption compared to being single. Thus, a priori, the effect of labor division is not clear. Moreover, the model by Manser and Brown (1980) assumes that the utility out of consumption depends on characteristics of the spouse. However, it is not straightforward to see how preferences with respect to labor division affect utility. Some may prefer the traditional specialization, other may favor the equal division.

5.3 Literature review

Our question of interest is related to the research on the relationship between female labor force participation and risk of divorce.[3] From the international perspective, it is quite common to use the wife's income as proportion of total household income as variable of main interest. The effect of this ratio is, however, not clear. Some studies find a destabilizing impact, e.g. Kesselring and Bremmer (2006) using a sample of the US Current Population Survey, Liu and Vikat (2004) with register-based data for Sweden, or Jalovaara (2003) with register-based data for Finland. Thus, despite of the fact that in particular Scandinavian countries stand for egalitarian gender attitudes the authors show that if the female's earnings account for a larger proportion of the total family income, the likelihood

[3] Since this problem has been discussed more extensively among sociologists than economists and moreover, the hypotheses and estimation methods are usually quite similar we also review some sociological studies.

of divorce increases. This effect is not compensated by the stabilizing influence of a higher family income. In contrast, other analyses do not find any statistically significant effect of this ratio (e.g. Sayer and Bianchi, 2000, Tzeng and Mare, 1995). However, the latter show that a change in wife's earnings raises the probability of divorce which cannot be found for changes in husband's earnings. Similarly, Weiss and Willis (1997) suggest that an unexpected increase in wife's wage earning capacity destabilizes a marriage, whereas an unexpected increase in husband's wage earning capacity lowers the probability of divorce.

Regarding the behavior of German couples, only a few empirical studies exist. With the exception of Hartmann and Beck (1999) and Stauder (2005), all studies are limited to the effect of the employment status and refrain from analyzing the different aspects of being employed. Ott (1992) finds a significant destabilizing impact of female full-time employment for West German couples. Similarly, in her comparison of divorce probabilities in West Germany and the former GDR until 1990, Böttcher (2006) shows a positive relationship between female full-time employment and risk of marital dissolution for both countries. In contrast, Wagner (1997) finds this pattern only for the former GDR. For West Germany, there is no significant effect for couples that married before 1975 and even a stabilizing effect for marriage cohorts after 1975. Hartmann and Beck (1999) provide a more detailed evaluation of the relationship between female employment and risk of divorce using data from the Mannheim divorce study. They find that, controlling for the female's labor force status, if the wife earns more than her husband marital stability decreases significantly. However, by the inclusion of this dummy, the destabilizing effect of her full-time employment is reduced. Conflicts about the division of housework and about time spent together also raise the divorce risk but do not significantly alter the effect of female employment. The higher propensity among full-time employed women to stay childless and to delay childbearing are two more destabilizing aspects related to full-time employment. Stauder (2005) concentrates on the influence of labor division between spouses after childbirth. Division is measured in time used for domestic and market work. According to his results, marital stability is significantly diminished if the wife has to bear the double burden.

In contrast to the majority of the existing literature, this paper considers not only the labor force status or the relative income but a combination of the relative income and the relative time used for housework. Thus, we include both aspects of specialization as modeled in Becker's theory of marriage. Unlike Stauder (2005), we do not restrict our sample to the time after childbirth. Moreover, we use the financial aspect of employment instead of time since the former should be more

important in the context of divorce and furthermore, this choice is in accordance with Becker's household model (see Sections 4.2.1 and 5.2).

5.4 Empirical approach

Our empirical approach is again to apply a complementary log-log model to estimate the conditional probability of divorce. For a more detailed description of the estimation method, see Chapter 4.4.1.

5.4.1 Sample

As in Chapter 4, we use data from the West German sample of the SOEP, waves 1984 to 2007. We only include couples that marry during the observation period so that we are able to follow a couple from the beginning of the marriage onwards until they separate or get divorced or until observations are right-censored. Again, we do not distinguish between separation and divorce.
Even though it would be very interesting to extend this analysis to both parts of Germany we restrict it to the West for two reasons. First, in the former GDR it was a social norm for women to work even after childbirth. Along with the ideological pressure, a low wage level, strong eligibility requirements for widow's pension, and restricted possibilities to claim alimony from the (former) husband in case of divorce forced women into full-time employment (see Berghahn and Fritzsche, 1991). Public provision of cheap and extensive child care for children of all ages made it easier to work full-time even after childbirth. In contrast, in West Germany, the lack of child care, incentives by the income tax system and stigmatization of working mothers have made it advantageous for wives to stay at home or to work at most part-time. Therefore, it is not reasonable to pool West and East German couples since the differences in female labor force participation and provision of public child care have continued to exist even after reunification.[4] Second, given our strategy to look only at couples that marry during the observation period, the sample of East German couples is too small to get reasonable estimates in separate regressions. Consequently, we only look at the effect of labor division on the probability of divorce of West German couples.
Another sampling problem is the treatment of the unemployed. In our opinion, a specific labor division induced by unemployment of one spouse is a special case. Losing the job is usually an unwanted, negative shock that affects the financial situation of the family as well as self-esteem and self-confidence of the individual

[4]For more information on family policies in West and East Germany, see e.g. Braun et al. (1994); Cromm (1998); Kreyenfeld (2004).

concerned (see e.g. Kraft, 2001; Charles and Stephens, 2004). In order to avoid mixing up different effects, we drop those observations in which at least one spouse is unemployed.[5]

We further restrict our data set to couples where both spouses are between age 18 and 65 at the beginning of the marriage. Our final sample consists of 1,128 couples with 8,758 couple-years and we observe 204 divorces and separations. Hence, the probability of divorce is 2.33 % per year, and 18.09 % of the couples finally separate. Moreover, we consider both, first marriages and remarriages. For 34.75 % of the couples, at least one spouse does not marry for the first time.

5.4.2 Explanatory variables

Labor division

We estimate the probability of divorce in period t given explanatory variables in $t-1$: $Pr(y_{it} \neq 0|x_{i,t-1})$. However, concerning labor market behavior, there is a potential reverse causality problem. If an individual suspects separation she will probably change her labor supply (see Johnson and Skinner, 1986). Therefore, we use lagged labor division variables of period $t-3$ instead of $t-1$ to circumvent this problem.

In order to find the effect of spousal labor division on the risk of divorce we define five labor division patterns depending on the wife's proportions of total household income and total time used for housework.[6] Therefore, we first generate the wife's monthly gross labor income (wage plus income from self-employment) as proportion of the household's monthly gross income to measure her economic success relative to the husband's.[7]

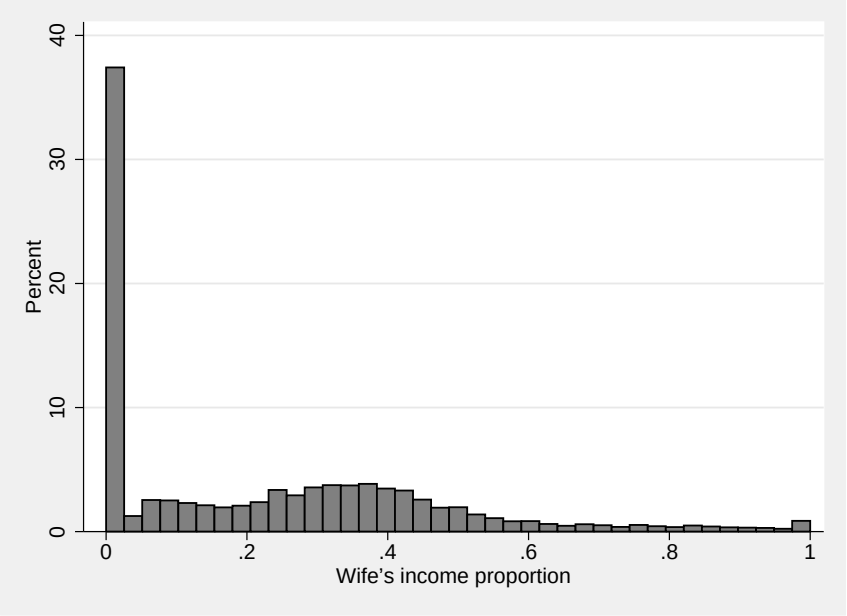
Figure 5.1 illustrates the distribution of the wife's proportion of the household's gross income. It shows that in the majority of observations the wife does not contribute any labor income to the household's income (36.94 %) or only a small fraction. In contrast, in only 0.67 % of all observations, the husband does not contribute. For 14.76 %, husband and wife earn roughly the same, i.e. the wife's proportion is between 40 % and 60 %.

[5] Nevertheless, our results are robust to the inclusion of the unemployed.

[6] With this strategy we follow Stauder (2005) who uses time used for market and domestic work, respectively, to generate five different labor division patterns.

[7] We decide to take the gross instead of the net income because of the special regulations for married couples in the German tax system. If the gross wage income of both spouses differ, the one with the lower income (usually the wife) pays a relatively high tax prepayment compared to his or her spouse since all tax allowances are assigned to the one with the higher income. This reduces the couple's overall sum of tax prepayments. However, it makes a direct comparison of net incomes unfeasible since they suffer from a systematic distortion by the German taxation. For an example, see e.g. Bundesministerium der Finanzen (2008).

Figure 5.1: Distribution of wife's proportion of gross income



As second element of labor division, we generate the wife's proportion of total time used for housework. "Housework" is an aggregate that subsumes time used for housework (in a narrower sense) and shopping, for child care, and for crafts, repairs, and gardening.[8] We prefer the aggregate to the narrow definition of housework since there may be an additional gender-specific specialization within housework chores which is, however, not part of our analysis.

Analogously to gross income, Figure 5.2 shows the distribution of the wife's proportion of total time used for housework. In this case, the distribution has not such an extreme peak. The mode of the sample is the equal sharing of housework (8 %). However, as expected, the wife's proportion is usually higher than the husband's. For 72.22 % of all observations, the percentage is higher than 60 %. For 4.56 %, the wife is solely responsible for the housework, whereas in only 0.37 % the husband is.[9]

In a next step, we define three groups of wife's income and housework proportions, respectively: The wife's proportion makes up 0 % to 40 %, 41 % to 60 %, or more than 60 %.[10] Then, we combine these income and housework-patterns with each other and generate five labor division combinations for our regressions:

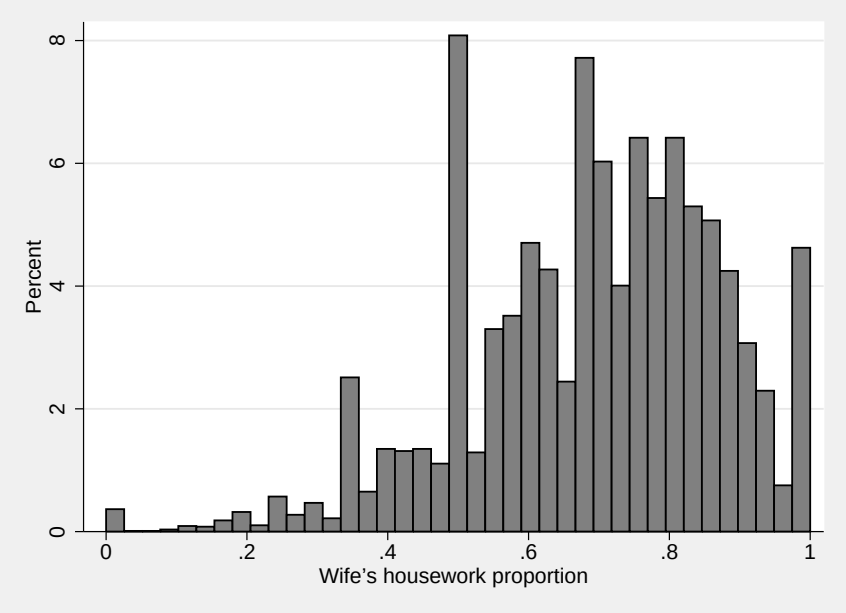
1. **Traditional labor division**: wife's housework proportion is larger than her income proportion;

[8] The SOEP asks for these activities separately.

[9] See Sections 5.7.2 and 5.7.3 for more details on wife's income and housework proportions over the course of marriage.

[10] Our results do not change substantially if we use intervals 35 % to 65 % or 30 % to 70 %.

Figure 5.2: Distribution of wife's proportion of housework



2. **Non-traditional**: wife's income proportion is larger than her housework proportion;

3. **Equal**: wife's and husband's shares are similar;

4. **Double burden husband**: wife's housework and income proportions are both smaller than the husband's;

5. **Double burden wife**: wife's housework and income proportions are both larger than the husband's;

Table 5.1 illustrates how the nine possible combinations of wife's income and housework proportion are assigned to these five groups, while Table 5.2 shows the distribution of these combinations in our sample.

Table 5.1: Income and housework combinations

Wife's income proportion	Wife's housework proportion		
	0.00-0.40	0.41–0.60	0.61–1.00
0.00–0.40	double b. husb.	trad.	
0.41–0.60	non-trad.	equal	trad.
0.61–1.00	non-trad.		double b. wife

For 82.06 % of all observations the traditional labor division can be found, whereas the non-traditional and the equal division can only be observed in 6.17 % and

5.71 % of all couple-years, respectively. As expected, there are only a few observations where one spouse is mainly responsible for both, earning income and doing housework. In 2.69 %, the husband bears the double burden, whereas in 3.37 % the wife does so. The traditional pattern is the reference group in regression (1). Since the non-working wives constitute such a large group in our sample we subdivide the pattern of traditional labor division. There may be a difference between wives that earn nothing and wives that earn at least some money. Therefore, we differentiate between wives with zero income and a housework proportion larger than 40 % (*Trad 1*), and wives with some income up to 40 % and a housework proportion at least 41 % (*Trad 2*). *Trad 1* is the reference group in regression (2).

Table 5.2: Descriptives of labor division variables

Variable	No. of obs.	in %
Traditional	7,187	82.06
of which:		
Trad 1: wife's prop. = 0 %	*3,209*	*36.64*
Trad 2: wife's prop. ≤ 40 %	*3,978*	*45.42*
Non-traditional	540	6.17
Equal	500	5.71
Double burden husband	236	2.69
Double burden wife	295	3.37
Total no. of observations	8,758	

All variables refer to period t-3.

Additional explanatory variables

In addition to the labor division variables, we include a set of important variables that are likely to have a substantial effect on the risk of divorce. Some are also related to our labor supply variables. In the following, we briefly explain their definition, descriptive statistics are given in Table 5.5 in Appendix 5.7.1.
First, in addition to the wife's income proportion, we also include the household's total gross income to control for level differences. Two other important aspects are education and the presence of children. Concerning education, we follow Blossfeld and Timm (2003) and define three hierarchical levels: "low" if somebody has no schooling degree, a *Hauptschul-* or *Realschul*-degree but no vocational degree; "medium" if the individual has no schooling degree, a *Hauptschul-* or *Realschul*-degree and additionally a vocational degree or if he/she has *Abitur/Fachhochschulreife*, with or without vocational degree. "high" means

a university degree or a degree from a university of applied sciences. Probably, the educational level also captures (at least in parts) the preference concerning the labor division. Women with higher human capital investments should be less likely to prefer the traditional division of work. Reference group in our estimations are low-educated spouses.
The presence of children is a very important factor in the labor supply decision of men and particularly women.[11] Therefore, we include the number of children of different ages in our regressions. We distinguish between age 0–1, 2–7, and 8–15, but not between own, adoptive and children from previous relationships. Since there may be differences in the supply of child care that in turn would affect female labor supply, we also consider a dummy for living in a city center. Nevertheless, urban life may also increase the risk of divorce because of the higher probability to meet a better match. Additional controls are age at marriage, the absolute age difference, a dummy variable if it is not the first marriage for at least one spouse, and marriage duration dummies that are all standard covariates in the literature on divorce.[12]

5.5 Results

Table 5.3 shows all coefficients of our random effects cloglog estimations. In regression (2), we further distinguish between the two cases of the traditional pattern when the wife has no income (reference group) and when the wife earns some money (Trad 2). Since we estimate a random effects model, Table 5.3 also includes ρ, the proportion of the total variance that is contributed by the panel-level variance. It ranges from 0.45 to 0.47. The hypothesis that $\rho = 0$, which would imply that the random effects estimator is not significantly different from the pooled estimator, can be rejected on a 5 % significance level. In the following, we will first briefly discuss the results for the other control variables, and then interpret the estimated effects of our labor division patterns on the risk of divorce in more detail.

Our results suggest that remarriages have a lower risk of separation than first marriages. However, the effects are not statistically different from zero. The same holds for age at marriage. As theory predicts, the coefficients are negative, i.e. the older someone is at the time of marriage, the more stable the relationship is going to be. However, as the dummy for remarriages, the effects are in either case not significant. The age difference between two spouses is a relevant factor.

[11] See Appendix 5.7 for differences in the development of income and housework proportions for women with and without children.
[12] For a more detailed discussion see Chapter 4.4.3.

Heterogamy with respect to age has a destabilizing effect. Similarly, as expected, city life reduces marital stability significantly. The effect of education was a priori not clear. On the one hand, high-educated have better outside options. On the other hand, for high-educated individuals, it is probably easier to form expectations and consequently, they have a lower risk to become disappointed. In our sample, the latter dominates, in particular for husbands. Medium- and high-educated people have a lower risk of divorce than the reference group of low-educated. The predicted stabilizing effect of children as marital investments can be found for new-born and small children, however, the latter is not significantly different from zero. For older children we find a destabilizing effect which we cannot explain with a marriage duration effect since we include marriage duration dummies in our regressions. Maybe spouses do not stay together just for the sake of the children if they seem to be old enough to cope with divorced parents. Moreover, household's total gross income has a positive but insignificant effect on the risk of separation.

Of main interest is the impact of labor division on the risk of divorce. We see that two patterns do positively affect the risk of divorce, whereas the others only have a relatively small and insignificant effect. The most striking result is that couples with a wife bearing the double burden have a substantially higher risk of divorce than couples with a male breadwinner and a housewife. Similarly, if the wife is the main earner and the husband does most of the housework, marital stability is considerably diminished. If both spouses share equally the jobs of earning income and doing housework, the risk of divorce is not substantially affected compared to the traditional labor division. In contrast, if the husband bears the double burden, marital stability is even enhanced, although, the effect is not significant. If we further subdivide the group with a traditional labor division, we find similar results for the first four patterns. The effects are, however, usually stronger. If the wife works but earns only up to 40 %, marital stability is not significantly altered compared to a situation where she does not work.[13]

Table 5.4 shows the computed average marginal effects for the labor division variables in regression (2). Given that the average predicted probability of divorce is about 0.016 per year, we see that couples with a wife bearing the double burden have a more than 135 % higher risk of divorce than couples with the traditional labor division. Similarly, non-traditional couples have a 94 % higher probability

[13] If we assign those couples with wife's income proportion 41 % to 60 % and housework 0 % to 40 % or 60 % to 100 % to the double burden groups, respectively, we still find the destabilizing effect of non-traditional and double burden wife couples. If we separate those of the non-traditional couples and those of the traditional couples who have an income proportion 41 % to 60 %, the coefficients for the two non-traditional groups are still positive and weakly significant. The lower significance can probably be attributed to the small number of observations (366 and 174).

Table 5.3: Coefficients of RE cloglog estimations

	(1)		(2)	
Equal division, t-3	0.1868	(0.3004)	0.3691	(0.3335)
Non-trad. division, t-3	0.5525**	(0.2735)	0.7277**	(0.3082)
Double burden husband, t-3	-0.4541	(0.5311)	-0.2607	(0.5530)
Double burden wife, t-3	0.7594**	(0.3235)	0.9315***	(0.3532)
Trad 2, t-3			0.2599	(0.2009)
Not first marriage	-0.0141	(0.2111)	-0.0341	(0.2150)
H: age at marriage	-0.0075	(0.0208)	-0.0069	(0.0212)
W: age at marriage	-0.0132	(0.0207)	-0.0112	(0.0212)
Absolute age difference	0.0499*	(0.0256)	0.0502*	(0.0261)
Live in City	0.7948***	(0.2302)	0.8084***	(0.2333)
H: high educ	-0.7021**	(0.3540)	-0.7113**	(0.3588)
H: med educ	-0.4656*	(0.2665)	-0.4826*	(0.2702)
W: high educ	-0.2981	(0.3895)	-0.3265	(0.3963)
W: med educ	-0.2569	(0.2353)	-0.2697	(0.2388)
No. of HH members age 0-1	-0.8766***	(0.3074)	-0.8652***	(0.3083)
No. of HH members age 2-7	-0.0762	(0.1200)	-0.0216	(0.1271)
No. of HH members age 8-15	0.2405*	(0.1266)	0.2558**	(0.1283)
HH gross income, t-3	0.0447	(0.0334)	0.0386	(0.0349)
Constant	-2.8445***	(0.6695)	-3.1310***	(0.7195)
No. of observations	8,758		8,758	
No. of couples	1,128		1,128	
ρ	0.44872		0.47020	
p-value $H_0 : \rho = 0$	0.028		0.020	
Log-likelihood	-931.823		-930.969	

1) Standard errors in parentheses.
2) *: p<0.10, **: p<0.05, ***: p<0.01.
3) "H": husband, "W": wife, "HH": household.
4) Results of marriage duration dummies not presented.
5) Reference groups: Low educated; Traditional/Trad 1.

Table 5.4: Average marginal effects

	(2)
Equal division, t-3	0.0065
	(0.0071)
Non-trad. division, t-3	0.0150*
	(0.0089)
Double b. husband, t-3	-0.0034
	(0.0065)
Double b. wife, t-3	0.0217*
	(0.0126)
Trad 2, t-3	0.0039
	(0.0034)

1) Table shows average effects of discrete change of each dummy variable from 0 to 1.
2) Standard errors in parentheses, computed by the delta method.

of separation. Hence, labor division does matter but specialization per se is not stability-enhancing. We rather find gender-specific differences. On the one hand, specialization has only a stabilizing effect if the traditional labor division between husband and wife is chosen. On the other hand, if the wife bears the double burden the risk of divorce is much higher unlike if the husband is in the same situation. Given that about 2/3 of divorces in Germany are initiated by women (see Bundesministerium für Familie, Senioren, Frauen und Jugend (2003)), our results suggest that financial independence is a necessary precondition for her to do so. Since the effect of "Trad 2" is not significant, her income must exceed a certain threshold for financial independence. Frustration of one or both spouses that the wife is the main earner and not the husband as traditionally expected is another factor that explains our findings.

5.6 Conclusion

Using a rich panel data set of German couples, we test the hypothesis that specialization in market work and housework increases marital stability. Gary Becker assumes that gains from marriage mainly result from the complementarity of man and woman in the production of home commodities. Therefore, one spouse should specialize in earning money (traditionally the husband), and the other one should specialize in doing housework (traditionally the wife) in order to reduce the risk of divorce. However, it is questionable whether this aspect still (if ever) matters. Nowadays, it is quite common for married women to work in the labor

market. Moreover, some families rely on her income, at least temporarily, since job histories of men are increasingly characterized by breaks with spells of unemployment. In addition, only recently, German policy-makers reformed parental leave-regulations in such a way that fathers have an incentive to take a share of the legal parental leave. Thus, the traditional labor division with a working husband and a housewife should be less prevalent and consequently less relevant for marital stability.

Our data set provides rich information for both spouses about e.g. labor force status, income, children, and time used for housework. Hence, we are able to test for the effect of actual labor division on the risk of divorce. We show that it matters who does what. While the equal division does not significantly alter the risk of divorce, couples with a female breadwinner and a househusband have a higher risk of divorce than couples with a male main earner and a housewife. Hence, specialization per se does not enhance marital stability, only the traditional one. Marital stability is also substantially reduced if the wife bears the double burden which we cannot find for husbands. Our results suggest that frustration that the wife is the main earner and not the husband (so that the wife could stay at home) as traditionally expected substantially reduces the gains from marriage.

5.7 Appendix

5.7.1 Descriptive statistics

Table 5.5: Descriptive statistics of control variables

Variable	Mean	Std. Dev.
For at least one spouse not first marriage	0.34	0.47
H: Age at marriage	31.92	7.96
W: Age at marriage	29.24	7.19
Absolute age difference	3.91	3.79
Live in city center	0.08	0.28
H: High-educated	0.20	0.40
H: Medium-educated	0.72	0.45
H: Low-educated	0.08	0.27
W: High-educated	0.11	0.31
W: Medium-educated	0.76	0.43
W: Low-educated	0.13	0.34
No. of HH members age 0–1	0.12	0.34
No. of HH members age 2–7	0.64	0.78
No. of HH members age 8–15	0.45	0.76
HH's gross income in 1,000 Euro of 2000	3.87	2.42
Total no. of observations	8,758	

1)"H:" stands for husbands, "W:" for wives, "HH" for household.
2) All variables refer to period t-1 except household's gross income.

5.7.2 Trends in wife's income proportion

Figures 5.3 and 5.4 show how the mean of wife's income proportion evolves over the course of marriage in our sample. Due to the increase in labor force participation of married women in the last decades we differentiate in Figure 5.3 between three different marriage cohorts: the time of marriage is between 1985 and 1989 (3,547 total observations), between 1990 and 1999 (4,431 total observations), and the youngest cohorts from 2000 to 2007 (780 total observations). We expected higher income proportions for younger cohorts. However, we see that there is hardly any difference in the development of wife's income proportion over the course of marriage. For all cohorts, the average income proportion drops from around 37 % at the beginning of the marriage to less than 18 % within the first eight to nine years of marriage. For the youngest cohorts it drops to approximately 22 %. After twelve years, the proportion slightly increases to more than 20 %.

Since the presence of children has a large impact on the labor supply of women, we distinguish in Figure 5.4 between couples with children between age 0 and

Figure 5.3: Mean income proportions over the course of marriage for different marriage cohorts

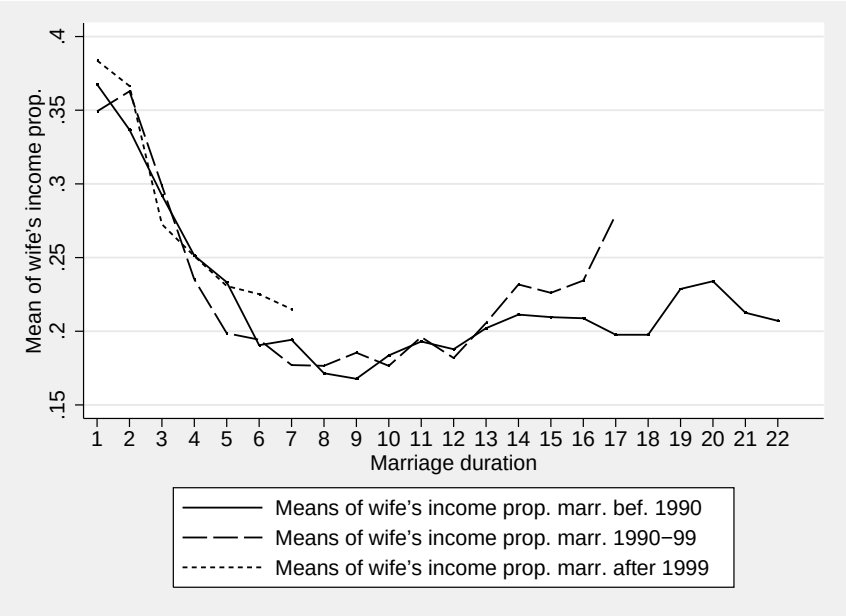
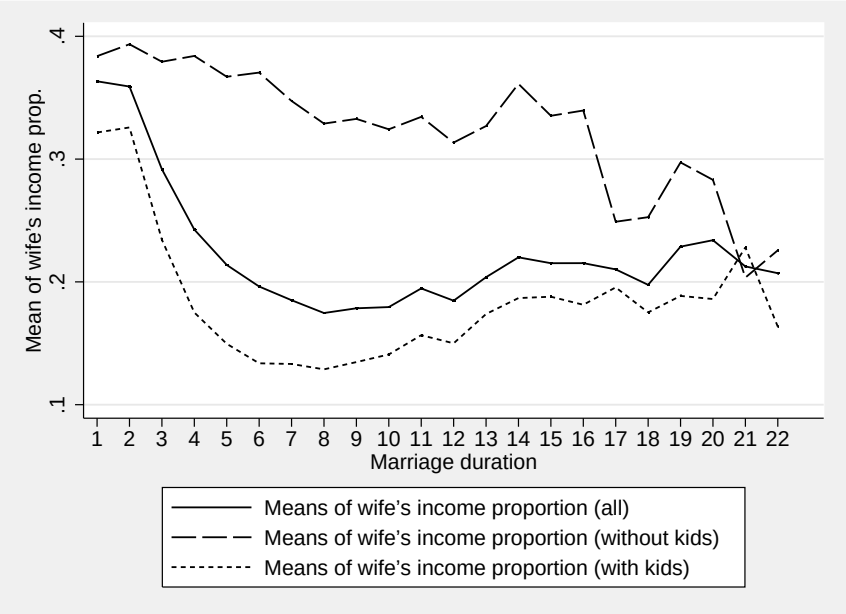


Figure 5.4: Mean income proportions over the course of marriage with and without children



15 (6,158 total observations) and without children (2600 total observations). We see that the drop in the first years of marriage can be mainly attributed to the presence of children. It can be observed for all cohorts. In contrast, the proportion of women without children remains relatively stable with about 35 % over the course of marriage. The decrease after 13 years of marriage could either be induced by the drop-out of divorced couples since couples with a female main earner display a higher probability of divorce. Another explanation could be that the wage gap between husband and wife increases over life time if, e.g., he benefits more from investments in his career than she does.

5.7.3 Trends in wife's housework proportion

Figures 5.5 and 5.6 show the development of the mean of wife's housework proportion. In Figure 5.5, we differentiate again between the above mentioned three marriage cohorts. Analogously to the drop in gross income, the wife's proportion of housework increases from around 58 % at the beginning of marriage to more than 70 % within the first seven years and remains at this level in the following years. Once more, the cohorts do not substantially differ, nevertheless, the proportion of the youngest cohorts is usually below the other cohorts' proportions.

In Figure 5.6, we see that, again, the development is mainly induced by the couples with children. Nevertheless, even without children, the wife's proportion increases steadily over the course of marriage. Thus, despite the ongoing equalization of men and women, we observe an increase in the gender-specific specialization over the course of marriage. This process seems to be (at least partly) induced by the presence of children. However, these figures are only descriptive and have to be interpreted very cautiously.

Figure 5.5: Mean housework proportions over the course of marriage for different marriage cohorts

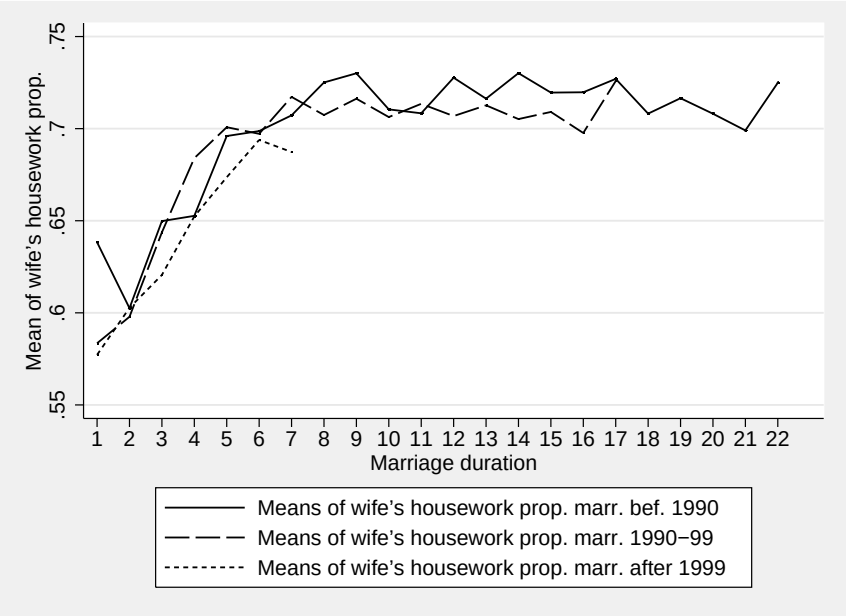
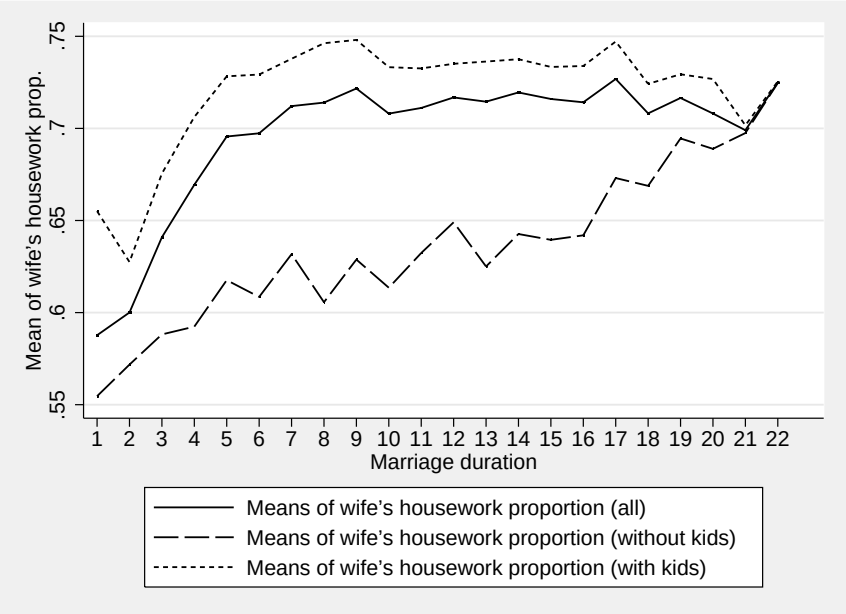


Figure 5.6: Mean housework proportions over the course of marriage with and without children



Chapter 6

Final remarks

The present thesis tries to obtain a better understanding how economic and marriage-related decisions are linked to each other. The first part deals with cross-spouse effects on economic decisions, in this case on health behavior and on labor force participation at older age. The second part examines the impact of various economic factors on the risk of marital dissolution. In summary, all chapters show that there are strong interrelationships between the two most important aspects in life, namely family and career. However, we also see that men and women react and behave differently. For instance, the wife has an effect on the husband's probability to see the doctor but not vice versa. Moreover, a female breadwinner increases the risk of divorce substantially which we cannot find for couples with a male main earner. Thus, the results suggest that economic theory and empirical analyses do not only have to consider the family background but also to distinguish between men and women.

Needless to say that there are still many open questions. For instance, except in Chapter 2, we restrict the analysis to married couples since cohabitation is less common among older people and moreover, separation has usually less severe consequences if the couple is not married. Nevertheless, given the growing acceptance and equal treatment under law, it becomes increasingly interesting to extend the analyses to cohabiting couples.

Moreover, not only family structure has changed, work life is also changing. More and more jobs, in particular for high-educated, require high flexibility and mobility by both, men and women. Consequently, for a larger section of the population, the success of a relationship is challenged by commuting and living apart together. It is not fully known yet to what extent these factors alter the risk of separation.

Another interesting aspect is the new parental-leave regulation. The new law provides financial incentives for fathers to take a share of the legal parental-leave. However, given our result that female and male breadwinners do not seem to be

perfect substitutes, the question is whether maternity and paternity leave have a different effect on marital stability.

Thus, there are still many aspects we do not know but, to conclude with Tina Turner, "some people gotta stay whatever and give one another shelter on a rainy day".

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Eidesstattliche Versicherung

Hiermit versichere ich, dass ich diese Dissertation selbstständig verfasst habe. Bei der Erstellung der Arbeit habe ich mich ausschließlich der angegebenen Hilfsmittel bedient. Die Dissertation ist nicht bereits Gegenstand eines erfolgreich abgeschlossenen Promotions- oder sonstigen Prüfungsverfahrens gewesen.

Dortmund, 16.Juli 2010