

Does “selection into specialization” explain the differences in time use between married and cohabiting couples? An empirical application for Germany

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Abstract

The aim of this paper is to identify the sources of time use differences between married and cohabiting couples and to answer the question whether there is a “selection into specialization”, i.e. whether cohabiting partners who agree on a (traditional) division of work simply have a higher probability of getting married. In a non-parametric matching approach, we compare couples who get married in the German Socio-Economic Panel between 1991 and 2008 with couples who remain cohabiters. Taking the potential selection into marriage into account, differences in the intra-couple division of market work and child care are considerably reduced by 54 to 66 percent. Thus, couples who anticipate specialization in time use (and its corresponding economic advantages) seem to pre-select into formal marriage. However, remaining differences in time use leave sufficient scope for an additional specialization-reinforcing effect of the institutional framework of marriage in Germany, particularly for the subsample of couples who become parents.

JEL Classification: J12, J22

Keywords: time use, intra-family specialization, marriage, cohabitation, matching approach

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1 Introduction

It is a well established fact that married or cohabiting men receive higher wages than unmarried ones. However, the marital wage premium is typically larger than the cohabiting wage premium.¹ In the German Socio-Economic Panel (GSOEP), a man who got married in the preceding year receives a 13 percent higher wage rate than a man who stayed single, whereas moving in with a partner is reflected in a cohabiting premium of 6.7 percent in the subsequent year (Barg and Beblo, 2009). The same data set reveals remarkable differences in the time use of married and cohabiting couples, suggesting a higher level of household specialization after marriage: For instance, the intra-household difference in paid working hours within married couples more than doubles the difference within cohabiting couples (4 versus 1.7 more hours spent on employment by the male partners)². Accordingly, married men not only spend less time on child care and household work than their spouses, but also do significantly less so than their cohabiting counterparts. The percentage of couples where the wife is full time employed is significantly lower among the married than among the cohabiting couples – 31 compared to 58 percent. Empirically it seems obvious that intra-household time use decisions differ depending on the legal status of the relationship. This paper aims to identify the sources of these behavioural differences between cohabiting and married couples and to answer the question whether and to what extent these differences can be explained by a “selection into specialization”.

In the presence of economic efficiency effects of intra-family specialization, one may argue that specialization should pay off and be observed regardless of the legal status of the relationship. From a sociological perspective, however, couples might act according to the family norms and gender roles their marital status imposes on them. That is husbands and wives may specialize regardless of the efficiency effects, whereas the time allocation of non-married couples may be more equalized or may solely depend on relative productivity advantages. The desire to ‘do family’, i.e. the desire to act as ‘husband’ and wife’, may be a reason for cohabiting couples to

¹ A number of empirical studies confirm a larger wage premium for marriage than for cohabitation (see e.g. Stratton, 2002; Cohen, 2002; Datta Gupta, Smith and Stratton, 2005; Ginther, Sundström and Björklund, 2006).

² See also Table 2.

marry. Therefore, a selection into marriage of couples who are willing to (traditionally) specialize may explain why the time allocation differs between married and non-married cohabiting couples. Additionally, different legal and institutional treatment of cohabitation and marriage, such as joint income taxation, (public) health insurance regulations, the entitlement for maintenance payments during the relationship and after split up, inheritance regulations and widows' or widowers' pensions, which apply to married couples only, provide incentives for formally married couples to choose a division of work between paid and unpaid work. These economic advantages may in turn encourage cohabiting couples to get married once they plan to specialize in time use. Empirical evidence supporting a specialization-reinforcing effect of marriage has been found accordingly by studies based on the GSOEP (El Lagha and Moreau, 2007; Ludwig, 2007). For the United States, where married and cohabiting couples are also treated differently by law, studies confirmed a statistically significant effect of marriage on housework division as well (Gupta, 1999; Ono and Yeilding, 2008; Shelton and John, 1993; South and Spitze, 1994). By contrast, studies focussing on more "liberal" countries such as Sweden and the UK found no significant time use differences between cohabiting and married couples (Kalenkoski et al., 2005; Ono and Yeilding, 2008).

Against this theoretical and empirical background, our research question is whether and to which degree "selection into specialization", i.e. a higher marriage probability of cohabiting partners who agree on and who anticipate a (traditional) division of work, contributes to explaining the time use differences between married and cohabiting couples? By use of a non-parametric matching approach on different outcome variables of time use in the GSOEP, we intend to find out whether marriage increases specialization measured in terms of time use differences between formerly cohabiting partners. Using a shifting 3-year panel window on marriages in the GSOEP between 1991 and 2008, cohabiting couples who marry in the reference year (t) and who are still married in $t+1$ are matched with likewise cohabiting couples who stay formally unmarried from year ($t-1$) to year ($t+1$). By holding constant characteristics that might have an impact on both, a couple's probability of getting married and its time allocation, we take account of the possible selection of couples into marriage. With the matching approach we hope to detect how much of

the observed marital specialization can be attributed to the hypothesis of “selection into specialization”.

The empirical literature on the time allocation of married and cohabiting couples has applied various methods to answer the question whether marriage has a (causal) effect on specialization. To our knowledge the selection hypothesis has been emphasized only by Haynes et al. (2009) and El Lagha and Moreau (2007). Haynes et al. (2009) investigate the daily time spent on house work of cohabiting and married women living in Australia and the U.K.. We go further by focusing on intra-couple time use differences in a country where the institutional framework provides multiple incentives particularly for married couples to specialize. Theoretically, our paper contributes to the literature by taking an interdisciplinary perspective on the selection hypothesis. Empirically, we propose a non-parametric matching approach to estimate the *extent* to which specialization differences between married and cohabiting couples can be attributed to selection. Though our topic is closely related to the paper by El Lagha and Moreau (2007), who analyze German couples’ time use based on the GSOEP as well, our empirical approach is more flexible in terms of the sample chosen and the parametric assumptions applied. It may thus provide a more general ground to draw conclusions on the behavior of cohabiting and newly married couples in the 1990s and 2000s in Germany.

Our results show that selection into marriage can explain a major part (up to 66 percent) of the observed time use differences between married and cohabiting couples. However, there remain statistically significant differences in the intra-couple division of market work and child care between recently married and cohabiting couples even when controlling for selection into formal marriage. Taking into account the birth of a child at about the same time as marriage reduces the remaining specialization-reinforcing effect of the marriage remarkably. We interpret this result as partial support for the “selection into specialization” hypothesis: couples who anticipate specialization, e.g. because they plan to have a child, evidently select into marriage. Once married, though, the work division remains, whereas cohabiting couples who become parents almost recover their pre-birth time use pattern after a number of years.

The paper is structured as follows: In Section 2 we review the theoretical background for intra-family work division and time use decisions to be related to marital status. We thereby draw on theories from family economics and family sociology as well as potentially specialization enhancing institutional differences between married and cohabiting couples in Germany. The matching approach is laid out in the third section, followed by a description of our data sampling procedure in Section 4. Empirical results on the propensity score estimation and the matched intra-family time use differentials of married versus cohabiting couples are presented in Sections 5 and 6. Section 7 explores the robustness of our results by looking at time use patterns over time – what happens, once couples are married? – and the scope for a specialization-reinforcing effect of the institutional framework. Section 8 concludes.

2 Theoretical background

There are deviating theoretical views as to whether work division and specialization in time allocation within the household should differ between cohabiting and married couples. In the origins of family economics (Becker, 1973), couples were seen to form households in order to concentrate on activities in which each of the partners has a relative advantage and in order to make use of the efficiency effects of intra-family specialization – regardless of the type of the relationship. According to this theory, the relative allocation of economic resources determines a couples' work division, independent of its marital status: the more one spouse gains on the labor market, the less time he or she will spend on housework and child care. In line with these assumptions of rational behavior, the economic exchange model argues that since men provide income for the family, women take on unpaid domestic labor in exchange (Brines, 1994). As women's time in paid labor and their contribution to the household income has increased over time, the division of housework has become more equal and less traditional. With regard to the effect of marriage on specialization, the economic exchange theory expects only weak differences between married and cohabiting couples that disappear when controlling for young children (Baxter, 2005). Evidence supporting this economic reasoning was found for Germany e.g. by Ludwig (2007), who revealed that marriage increases the domestic work division between men

and women, depending on their respective shares of labor earnings. Bargaining models of the family or the collective framework³ also predict an intra-household work division to depend on the spouses' respective earnings. However, a differing behavior between married and cohabiting couples would only be expected due to the institutional framework — e.g. if institutional differences ensured a better bargaining position of the weaker (= lower earning) spouse who specializes in domestic-labor, only when the couple is married (see the discussion on institutional differences between marriage and cohabitation below).

Family sociology often takes a more normative-cultural perspective and argues that partners act depending upon what they believe and have learned as being the appropriate behavior for men and women. The theory of 'doing gender' states that everyday interactions within couples reinforce the partners in performing their gender roles regardless of the allocation of their resources (Berk, 1985; West and Zimmerman, 1987). With the growing importance of cohabitation as a new family type, the 'doing gender' approach was extended to the 'doing family' hypothesis which argues that within marriage, individuals act according to their roles as 'husbands' and 'wives' and that this family-role performance results in higher levels of specialization within marriage than within cohabitation (Shelton and John, 1993). Moreover, there is the argument of "gender trumps money" (Bittman et al., 2003) which – to some point – contradicts the economic exchange model: Based on empirical evidence from Australia (Bittman et al., 2003) and the U.S. (Brines, 1993; Greenstein, 2000) it states that family norms frame married couples' work division and make wives bear the main part of domestic labor even when they earn more than their husband. For the United States, Shelton and John (1993) as well as South and Spitze (1994) found the gender gap in time spent on housework to be greater in married couple households as compared to cohabitations, even when controlling for children and reduced hours of paid work for women. In both studies this result was interpreted as support for the 'doing family' approach.

More recent economic *and* sociological literature mentions an additional explanation for specialization differences between married and cohabiting couples. It is argued that institutional

³ For an overview see e.g. Vermeulen (2002).

differences between marriage and cohabitation, such as joint taxation for married couples, promote specialization particularly within marriage (El Lagha and Morau, 2007; Barg and Beblo, 2009). For the purpose of testing the impact of cultural-institutional differences, Ono and Yeilding (2008) compared the time spent on childcare of Swedish and U.S. married and cohabiting couples. They suggest the United States to provide an institutional setting where rights and resources are rather unequally distributed between married and cohabiting couples, while Sweden creates an institutional context in which marriage and cohabitation are legally and culturally perceived as similar unions. In fact, the authors found married and cohabiting couples in the United States to differ strongly with regard to their division of time spent on child care, whereas the allocation of childcare among Swedish couples appeared not to depend on the couples' marital status. Accordingly, Kalenkoski, Ribar and Stratton (2005) found no childcare differences between cohabiting and married couples living in the UK – a country where the institutional framework of cohabitation and marriage is rather similar as well (Odersky, 2006).

In Germany (like in the U.S. and many other countries) cohabitation and marriage have a different legal status. The legal framework of marriage and cohabitation is expected to enhance specialization differences between married and cohabiting couples via two different mechanisms. First, some institutional differences have a *direct* specialization-reinforcing effect: financial benefits for couples with unequal incomes or with only one spouse employed, create an immediate incentive to specialize. Second, other institutional differences have an *indirect* effect since they protect the spouse that specializes on domestic labor against power and welfare losses during the relationship or after dissolution. This latter mechanism is based upon the idea that specialization in house work and child care by one partner constitutes a trust problem (see e.g. Youm and Laumann, 2003, Breen and Crooke, 2005 for the sociological perspective) or hold-up problem (put the same thing economically, see e.g. Ott 1993). While the trust problem may be resolved by the “institutional embeddedness” of marriage (Rijt and Buskens, 2006), the hold-up problem can be reduced by setting up a contract, such as marriage. Table 1 lists the features of the institutional framework in Germany that are expected to affect couples' time allocations and indicates the type of effect at work.

First of all, joint taxation of married couples combined with a tax allowance for each partner creates a greater economic incentive for married spouses to specialize in a breadwinner-housewife-type model (or vice versa) than for cohabiting ones, since the more unequal the individual incomes of the spouses are, the lower is the marginal tax rate of the couple and the larger is the resulting tax benefit. Coverage of the not employed spouse by the public health insurance of the spouse who is employed provides a similar *direct* effect for more specialization within married than cohabiting couples. It even encourages the married partners to allocate their time in a way that one spouse does not work at all in the labor market. Moreover, married couples benefit from joint ownership of income flows (capital income, employment income).⁴ This regulation entitles the spouse with no or less labor market income – usually the spouse who specializes on domestic labor – with half of the income of the working spouse. In order to secure the economic and emotional power of the spouse who undertakes the main part of the house work and who, therefore, has no or few own labor market income, the German legal system has introduced the institution of “Schlüsselgewalt”. This law allocates the financial power within a married couple independently from the intra-household income distribution. Since cohabiting partners have no such power-ensuring institutional framework, they might be less willing to take the “risk” of specialization on housework and child care. The obligation of the spouse who provides the household with labor market income to financially support the spouse who focuses on domestic labor has a similar “insurance aspect” that helps overcoming the trust (or hold-up) problem associated with specialization. The law for widows’ or widowers’ pensions creates rather long-term returns, as only married are entitled and thus may be willing to engage in intra-household specialization in view of future compensation. Similar *indirect* effects that may support selection into marriage and encourage specialization within marriage but not within cohabitation are created by inheritance regulation and the regulations for ownership division and maintenance payments after split up. After a divorce, the financial capital a couple built up during marriage is equally divided and meant to compensate that spouse who accumulated no or little own labor market income during marriage for the time input she (or he) has invested in house

⁴ Though, the German legal system automatically entitles married couples to *joint ownership of flows* (“Zugewinnngemeinschaft”); they can choose other legal frames for managing their ownership (see Ivo, 2006: 419).

work and child care and her (his) foregone earnings. In comparison, the maintenance support after divorce does not compensate foregone earnings and foregone tenure unless a child has been cared for. If one spouse cares for a child up to 8 years old or for two to three children up to 14 years old he (or she) is entitled to receive financial support by the other spouse if not able to provide the income her- (or him-) self.⁵ The splitting cohabiter, on the contrary, is only entitled to receive maintenance support if he or she sacrifices employment for raising a mutual child under 3 years of age. In addition, there are lower dissolution costs for cohabiting couples. As a result, cohabiters may face a lower commitment level which translates into a shorter expected duration of the relationship and hence less specialization, as this is a more risky investment for a non-married partner who specializes in housekeeping. Evidence for this effect is provided by Ginther, Sundström and Björklund (2006) for Sweden. In line with the “insurance aspect” of the institutional setting, Stratton (2005) argues that specialization is more likely to occur in stable relationships and since cohabitations are known to be of shorter duration and less stable than marriages, one might expect cohabiters to specialize less than married partners. Though, causality may work the other way as well, such that specialized partners have a higher expected duration of the relationship because they have more to lose. Finally, men only automatically become legal fathers of their children, if they are married to the mother. Otherwise the mother has to approve fatherhood. As a consequence, marriage may encourage a higher commitment level for the division of work and sharing of resources within the couple.

⁵ Depending on age and health of the spouse in need, he or she can be entitled to receive financial support as well (for more detail see Ivo, 2006: 439f.).

Table 1: Specialization-enhancing institutional differences between marriage and cohabitation in Germany

	Married couples	Cohabiting couples	Reason for more specialization in intra-couple time use when being married
Taxation	Joint taxation	Individual taxation	} <i>Direct</i> effect through lower marginal tax respect. insurance rate
Health insurance	Not employed spouse is covered by (public) health insurance of employed spouse	Individual insurance	
Ownership	Joint ownership of the increase in capital value of assets	Individual ownership	} <i>Indirect</i> effect through more financial security → trust problem and hold-up problem less severe
Power of disposition on financial resources	“Schlüsselgewalt”, i.e. power conferred upon the spouse in the interest of the household	No legal power allocation	
Maintenance support during partnership	Obligation to support spouse (in particular the spouse with no/few income who undertakes the house work)	Obligation to support only if the couple has a child under 3 years of age	
Widow’s/widower’s pension	Entitlement	No entitlement	
Dissolution costs	Legal fees depending on the income level	No legal costs	
Division of ownership after dissolution	Division depends on joint assets	No legal regulation of division	
Maintenance support after dissolution	Support depends on joint income during marriage	Obligation for support only if the couple has a child	
Parenthood	Male spouse is legal father of children born during the marriage ⁶	Legal fatherhood has to be approved by both, cohabiting partner and mother	

Both the economic as well as the sociological theories predict married couples to specialize more than cohabiting ones. At first glance, the economic approaches seem to contradict this hypothesis, but when taking the institutional context into account, enhanced specialization after transition

⁶ Except the male spouse does not recognize the paternity or another man’s paternity has been judicially determined (Ivo, 2006).

into marriage appears to be an economically efficient and perfectly rational choice for many couples.⁷

However, apart from marriage having a *causal* effect on a couple's division of time between market work, housework and child care, there may also be selective sorting into marriage, if couples who – for several reasons – are more likely to specialize also have a higher probability of getting married. Sociological research has shown that, in Germany, religious people and those with traditional beliefs on the division of labor are more likely to get married (Schneider & Rüger, 2007) and to specialize (Ross, 1987; Fuwa, 2004). For Australia and the U.K. Haynes and colleagues (2009) showed that single women who spent a lot of time on house work also devote more time to house work after marriage, while women with relatively low levels of house work when married are more likely to divorce. From these findings the authors concluded that time spent on house work may indicate an inclination for home-making activities that encourages these women to form (or sustain) relationships. In particular the legal differences in the (*direct* or in *indirect*) promotion of specialization within marriage and cohabitation may reinforce selection into marriage. To couples who anticipate unequal earnings and employment status in the future and are aware of the economic advantages of being married induced by the institutional framework getting married is a rational and efficient strategy. The same goes for the “insurance aspect” of marriage: Couples who plan a division of tasks, in particular the partner who plans to dedicate more time to domestic labor and, hence, will have to take the risk of welfare and power losses during the relationship and in case of dissolution, has a strong incentive to get married to benefit from the “insurance aspect” of regulations such as maintenance support.

From this theoretical and institutional discussion we conclude that the observed “specialization effect of marriage” may in fact be due to a “selection into specialization” of couples who anticipate specialization (e.g. because they plan to have a child and divide tasks) and who want to benefit from the economic advantages and the “insurance aspect” of marriage.

⁷ Though, ignoring the dynamic bargaining effects within the couple (see e.g. Ott 1992, Beblo 2001).

3 Empirical analysis

The simplest way to assess the specialization effect of being married seems to compare the time uses of married and non-married couples. As mentioned in the introduction already, descriptive analyses reveal remarkable differences in the work division of married as compared to cohabiting couples (see Table 2). However, to conclude on a causal effect, would only be valid if married couples formed a randomly selected subgroup of all couples. As illustrated in Table 2, married and cohabiting couples differ in other socio-economic aspects as well, which are more or less related to the observed time uses. For instance, spouses in cohabiting couples show more similarity than married spouses with respect to their occupational degrees and their contributions to the total household labor income. In terms of household characteristics, married couples dispose of more household income (also due to their higher age) and live with a child in the household more often than cohabiters. Finally, couples in East Germany are less often married than in West Germany.

Table 2: Characteristics of married and cohabiting couples

	Married		Cohabiting	
	Men	Women	Men	Women
<i>Time use per weekday</i>				
Job hours	8.66	4.64	8.42	6.71
Child care hours	0.89	3.44	0.71	2.30
Housework hours	1.40	4.50	1.81	3.32
leisure time	1.68	1.66	1.90	1.75
Full time employment (%)	0.86	0.31	0.80	0.58
<i>Individual characteristics</i>				
Age	44.12	41.54	36.06	33.69
No occupational degree	0.14	0.21	0.16	0.19
Occupational degree, apprenticeship				
University degree	0.22	0.17	0.20	0.19
Non-German nationality	0.15	0.14	0.06	0.04
Share of total household labour income	0.72	0.28	0.60	0.40

Household characteristics

Net household income	2732	2732	2498	2498
Presence of a child in the household	0.56	0.56	0.33	0.34
Living in East Germany	0.25	0.25	0.32	0.32
Observations	62866-67805	64148- 67792	9134-9918	9208-9931

Source: Own calculations based on GSOEP waves 1991 to 2008. Arithmetic means of all women and men within the observation period with valid information on their spouses.

In light of these observed differences and according to the selection and specialization hypotheses, couples neither seem to sort randomly into marriage nor are they equally affected by it. Instead, a selection bias may emerge if the likelihood of marriage is related to the time use. If cohabiting couples who (plan to) specialize are more likely to marry, the true time use differential between married and non-married couples will be overestimated. In this way, our research question may be interpreted as a classical evaluation problem, where counterfactual outcomes are to be estimated in order to assess the causal specialization effect of marriage.

To produce a credible estimate of this counterfactual or hypothetical outcome, we apply the method of matching which identifies the causal effect of a “treatment” by comparing the time use differences of a just married couple with the time use differences that would have been realized, had that same couple stayed cohabiting (Rubin, 1974). This yields the average treatment effect on the treated (ATT), an estimate of the average expected effect of marriage on time use differences for all marrying couples.

Let Y_{1i} denote the time use difference (e.g. hours of market work or hours of child care) of a couple one year after marriage and let Y_{0i} denote the time use of a couple who stays unmarried. Then, the ATT is given by:

$$ATT \equiv E(Y_{1i} | D_i = 1) - E(Y_{0i} | D_i = 1)$$

where D_i is an indicator variable which equals one if couple i is married and equals zero otherwise.

As the hypothetical time use difference $E(Y_{0i} | D_i = 1)$ (i.e. of a married couple not being married) cannot be observed, we have to refer to time use differences of unmarried but otherwise similar couples. According to the Conditional Mean Independence Assumption (CMIA) (Rosenbaum and Rubin, 1983), Y_0 is the same for treated and untreated individuals (here couples) in expectation, if we control for differences in observable characteristics X :

$$E(Y_{0i} | D_i = 1, X) = E(Y_{0i} | D_i = 0, X)$$

Hence, if we assume that selection into marriage is taken up by this set of individual characteristics, any remaining difference between treated and non-treated couples can be attributed to the effect of marriage. By conditioning on X , we can select the appropriate control group of non-treated, i.e. non-married, couples by means of propensity score matching where every couple in the treatment group (married) is matched to a comparable control couple from the non-treated group (non-married). The vector X includes all variables available that presumably affect the event of marriage while being related to intra-family time use decisions as well.

We estimate a Probit model of getting married and derive the corresponding PS to identify comparable couples. The intuition behind the PS matching is that individuals (here couples) with the same probability of “treatment” can be paired for purpose of comparison. In our setting, it describes the likelihood of getting married in the following year for every couple in the sample. In the next step, married couples are matched to unmarried based on their estimated probability of belonging to the treatment group, given by the distance metric $PS = P(X)$ (Rosenbaum and Rubin, 1983). We apply nearest neighbor matching with replacement, where for each married couple that one non-married couple with the closest PS is selected.⁸

It may be argued that the CMIA is not applicable in this context, as there are unobserved characteristics as well that raise a couple’s probability of getting married and choose a certain time use arrangement at the same time. If the impact of those unobserved traits is large enough we would expect to see systematic differences between the treatment and the control groups even after matching which might still not to be attributed to the mere event of marriage. Our reply to

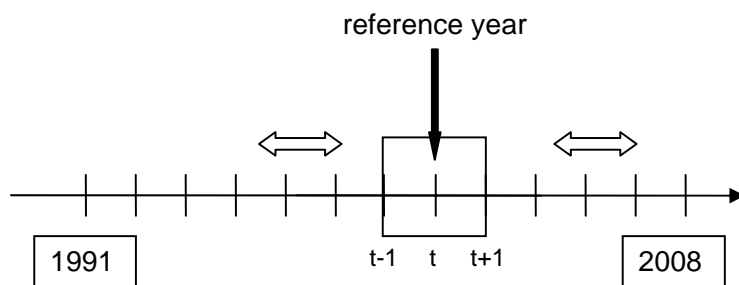
⁸ A detailed discussion of the advantages and disadvantages of different PS matching algorithms can be found in Imbens (2004).

this concern would be that, if any, the limitations of the matching approaches pose an upper limit to the detection of a selection effect. Hence, our results will provide a rather conservative measure of the true selection effect at work. Compared to alternative methodological strategies that would take into account selection and (time-constant) unobserved heterogeneity (e.g. a Heckman correction with panel fixed effects), the matching approach has the advantage of not imposing parametric assumptions on the selection model.

4 Data sampling

The data used for our analysis are based on eighteen waves of the German Socio-Economic Panel (GSOEP). The GSOEP is a yearly micro-data panel which has been conducted in annual interviews of individuals and households since 1984 in West Germany and since 1990 in East Germany.⁹ Although not being as informative as a time-use survey as regards the individual use of time, the GSOEP has the advantage of containing many additional socioeconomic variables. It is best suited for our analysis as it contains information on wage income and various individual characteristics that are likely to affect marriage prospects and intra-family work division at the same time. Participants in the survey provide information about their living circumstances in each year, such as whether they live with a partner and their formal family status. Moreover, this information is available over a long period of time which enables us to gather a decent number of respondents who experience a marriage within the 18-year observation period.

Figure 1: Shifting panel window



⁹ For a detailed description of the data set see SOEP Group (2001).

As illustrated in Figure 1, we apply a shifting panel design for marriages between 1992 and 2007, within the observation period 1991 to 2008. A panel window of 3 years ensures that we only consider respondents who are observed one year before marriage ($t-1$) and one year following the year of marriage ($t+1$). Respondents who have a change in their reported family status from unmarried to married in two subsequent years within the observation period are labeled as belonging to the treatment group I (“married”) of that specific sample year t . Likewise, all respondents who remain unmarried but cohabiting during the corresponding 3-year window (that is, from $t-1$ to $t+1$ around the sample year) qualify for the control group. Divorcees and widowers are not considered in either of the groups. Thus, the treatment group consists of couples who are married in t for the first time and the control group includes couples who have never married up to $t+1$ (but may still do so in the future).

In addition to the restrictions imposed by the shifting panel design, the sample is further limited to adults between the ages of 20 and 60 and those who have finished (or abandoned) education to prevent the results from being excessively affected by education decisions and early retirement behavior.

In total, by focusing on marriages between 1992 and 2007, we make use of GSOEP data of the survey years 1991 to 2008. The total number of couples marrying over the 18-year observation period and matching our sampling criteria is 518 whereas that remaining in cohabitation is 2054.

Time use information is drawn from a set of items in the GSOEP questionnaire where respondents are asked to report the average amount of time per day spent on employment, housework, errands, gardening, repairs, child care and hobbies or other leisure activities. To cope with a few respondents who report simultaneous activities cumulating to more than 24 h per day, we restrict the sum of all work activities to 18 hours per day (thereby allowing at least 6 hours of physical regeneration). We hereby treat time spent on paid employment as given and, if necessary, downscale other family work activities as these are more often performed simultaneously. The time-use data in the GSOEP are based on the following questions: “What

does a typical weekday look like for you? How many hours per day do you spend on the following activities? 1) job, apprenticeship, second job (including travel time to and from work), 2) errands (shopping, errands, citizen's duties), 3) housework (washing, cooking, cleaning), 4) child care, 5) education or further training, studying (also school, college), 6) repairs on and around the house, car repairs, garden work, 7) hobbies and other free-time activities.”¹⁰ Hours shall be reported for weekdays, Saturdays, and Sundays separately by both the husband and the wife, but annual data is available for weekdays only. For this reason, we concentrate on time uses on weekdays. We define the first category as employment hours, the second, third and sixth as housework and the fourth as child care.¹¹

5 Propensity Score Estimation

A Probit model is estimated for couples to assess the probability of a transition from cohabitation to marriage. According to the CMIA (that selection into marriage is taken up by this set of individual characteristics and any remaining time use difference between treated and non-treated individuals can be attributed to the effect of marriage), the models include explanatory variables on characteristics one year before marriage ($t-1$) that are assumed to have an influence on both, the propensity to marry as well as how time will be allocated. Due to the longitudinal perspective of our analysis, our choice of variables that might serve as conditioning characteristics for the matching of married and cohabiting respondents is limited. We are confined to variables gathered in each year over the whole period from 1991 to 2007 (time of matching, $t-1$). We distinguish three sets of variables for both spouses:

Socio-economic characteristics including age, education, region, nationality, (birth of) children.

¹⁰ In the years 1991 to 1997 the wording of the time use question differed marginally: “Now some questions about your week days. How many hours per day do you spend on the following activities? 1) job, apprenticeship, second job (including travel time to and from work), 2) errands (shopping, errands, citizen's duties), 3) housework (washing, cooking, cleaning), 4) child care, 5) education and continuing education (also school, college), 6) repairs on and around the house, car repairs, garden work, 7) hobbies and other free-time activities.

¹¹ We choose a rather broad definition of housework to encompass both typically female- and typically male-denoted activities at home.

Employment and time use characteristics including employment status, occupational status and intra-family differences in time spent on employment, housework and child care.

Satisfaction and concern variables include satisfaction with life in general and concerns about the own and the general economic situation.¹²

With a descending specification search we obtain the estimation results reported in Table 3. Most of the estimated coefficients have the expected signs and sizes. Whether the couple lives in East Germany and – most importantly – whether a child was born within the year of marriage or in the subsequent year is statistically significantly and positively related to the probability of getting married. Gender differences do exist with respect to the impact of age, nationality, life satisfaction and self-employment. Only the female partner being between the age of 30 and 39 and being satisfied with life in general as well as the male partner having German nationality is positively related to the couple’s probability of getting married. In contrast to this, male self-employment is negatively related. Finally, couples are the more likely to change from cohabitation into marriage the larger the male partner’s earnings’ contribution to the household, that is the less symmetric the spouses’ labor income shares are.

Table 3: Probit model of marrying in t

	Coeff. estimate	Std. error
<i>Characteristics in t-1</i>		
Woman: Age 30 to 39 (reference: 20 to 29 or 40 to 59)	0.1971	0.0732
Man: Age 20 to 29 (reference: 40 to 59)	0.4088	0.1152
Man: Age 30 to 39	0.3583	0.1047
Age difference	0.0304	0.0082
Woman without educational degree	-0.2561	0.0917
Difference in years of schooling (man’s – woman’s)	0.1357	0.0683
Living in East Germany	-0.4292	0.0721
Man has German nationality	0.5076	0.1488

¹² We would like to include variables that also measure traditional attitudes and religion, but unfortunately the GSOEP does not provide this information for subsequent waves.

Woman has German nationality	-0.2760	0.1504
Woman is fulltime employed	0.2109	0.0875
Man is self employed	-0.4516	0.1317
Labor income ratio (man's gross income/both partners' gross income)	0.4939	0.1500
Woman's satisfaction with life (10 point scale)	0.0962	0.0212
Difference in hours child care (man's – woman's)	-0.0193	0.0117
Child born in year of marriage	0.8814	0.1060
Child born in subsequent year	0.9491	0.1049
Constant	-2.1996	0.3224
Pseudo R ²	0.1474	
$\chi^2(31)$	380.93	
No. of observations	2572	

Source: Own calculations based on GSOEP waves 1991 to 2007 (sample definition based on 1991 to 2008).

Note: Year of marriage included as a dummy-set of control variables.

6 Matching Results

Based on the estimated propensity scores, couples of the treatment group “married” are now matched to their neighbors, based on a kernel density function, within the control group of “still cohabiting” couples. The results are presented in Table 4.

The average difference in the number of hours married spouses devote to employment is 4.15 hours whereas the unmatched differential of cohabiting spouses amounts to only 1.7 hours on average. This yields a significant unmatched specialization gap of about 2.45 hours which represents 59 percent of the married time use differential. After balancing the samples with respect to observed characteristics, the adjusted intra-family time use difference of cohabiters rises towards the level of the married (3 hours). The specialization differential falls by more than half to 1.1 hours but is still statistically significantly different from zero.¹³ Interpreting this ATT

¹³ Since standard errors provided by the Stata procedure `psmatch2` do not take into account that the propensity score has been estimated, we use bootstrapping (with 100 replications) to conclude on statistical inference. According to Abadie and Imbens (2008), the bootstrap provides valid inference for kernel-based matching methods, whereas it is

of 27 percent, a randomly chosen couple from the sample of married would still reveal a more symmetric time use division if not married.

Table 4: Time use differentials between married and cohabiting couples

Difference in time use in t+1 on:	Married (#518, whereof 2 are without common support)	Cohabiting (#2,054)	Absolute difference (in hours)	Relative difference (in %)
Employment				
Unmatched (Std. Error)	4.15	1.70	2.45 *** (0.31)	59
Matched ATT (Std. Error)	4.13	3.03	1.10 *** (0.27)	27
Child care				
Unmatched (Std. Error)	-3.51	-1.34	-2.16 *** (-0.17)	62
Matched ATT (Std. Error)	-3.49	-2.76	-0.72 *** (-0.27)	21
Housework, Repairs...				
Unmatched (Std. Error)	-1.59	-1.04	-0.55 *** (-0.11)	35
Matched ATT (Std. Error)	-1.58	-1.34	-0.24 (-0.15)	15

Source: Own calculations based on the Probit estimation results of Table 3 and Stata matching algorithm psmatch2 by Leuven and Sianesi (2003). GSOEP waves 1991 to 2008. Standard errors obtained from bootstrapping with 100 replications.

Note: *** indicate a statistically significant difference at the 1% level, ** at the 5% level and * at the 10% level.

The outcome variable child care yields the mirror picture of employment. Without controlling for differences in observed covariates, married women invest significantly more time in child care than cohabiting ones in comparison to their spouses. After controlling for differences in observed characteristics the matched gap of child care decreases to 0.7 hours (or 21 percent) and is still statistically different from zero at standard levels. The third outcome variable, housework, yields

“not valid as the basis for inference with simple nearest-neighbor matching estimators with replacement and a fixed number of neighbors” (p. 1546).

a slightly different result. Starting from an observed time use difference of almost an hour between the housework gaps of married and cohabiting couples (the gap being much smaller between unmarried spouses), after matching the ATT reduces to statistically not significant 15 minutes.¹⁴ A randomly chosen couple from the sample of married couples would, thus, show less asymmetric time use if not married. This result confirms that specializing spouses with fewer symmetric respectively homogenous socio-economic and attitudinal characteristics and engaged in family planning are more likely to marry. Hence, when comparing married to cohabiting couples, the specialization gap seems attributable to a large extent to a selection process into marriage. With regard to intra-couple differences in time spent in the labor market and on child care, more than half respectively two thirds of the specialization gap can be explained by selection into marriage. The gap in specialization on house work seems to be even fully attributable to selection (given the non-rejectable H_0 of no difference).

We may therefore conclude that the results of the matching approach largely support our selection-into-specialization hypothesis.¹⁵

7 Once married...

Though selection into marriage and, hence, into specialization seems to explain a great part of the time use differences between married and cohabiting couples, a remaining specialization-reinforcing effect of marriage may become evident over the course of time. Institutional regulations in Germany such as joint taxation of married couples, public health insurance coverage and maintenance support do not only encourage couples who anticipate specialization to marry. As described earlier, they also provide strong economic incentives and an institutional insurance for married couples to specialize, even if they did not plan to do so initially. Moreover, ‘doing family’, i.e. acting according to the roles of ‘husband’ and ‘wife’, might only evolve over the years of being married. As a sensitivity analysis, in order to investigate whether a remaining

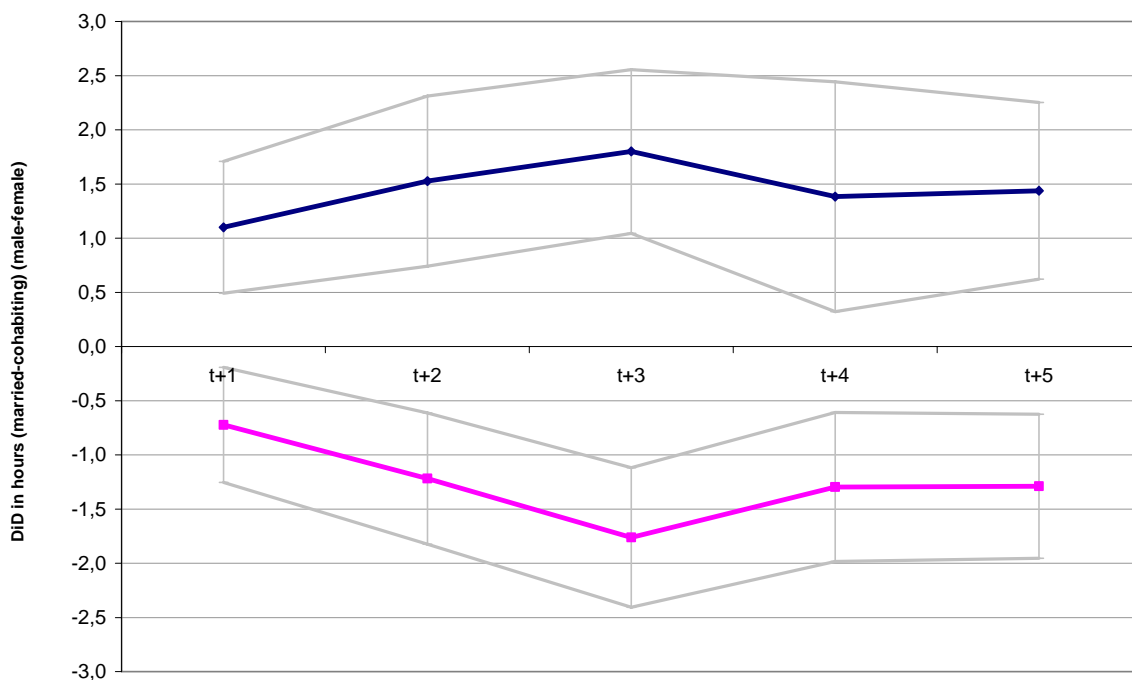
¹⁴ With a more narrowly defined housework variable, where we consider only pure housework and errands and exclude repairs and gardening, the ATT is slightly larger and statistically different from zero at a 10 percent significance level.

¹⁵ Sensitivity analyses with alternative matching procedures such as nearest neighbor matching confirm these results.

effect of marriage on specialization becomes evident over the years, we compare the average treatment effects on the treated (ATT) during a five-year period after marriage (Figure 2).

Net of selection effects, the specialization gap between married and cohabiting couples indeed increases between the first three to four years of marriage (t+1 to t+3) with regard to time spent in the labor market and time devoted to child care.¹⁶ In the 4th survey year after marriage has been reported, both ATTs decrease slightly again, but remain statistically significantly different from zero and above the t+1-level until the 5th survey year.

Figure 2: ATTs of intra-couple time use differences for week day employment hours and week day hours spent on child care over time



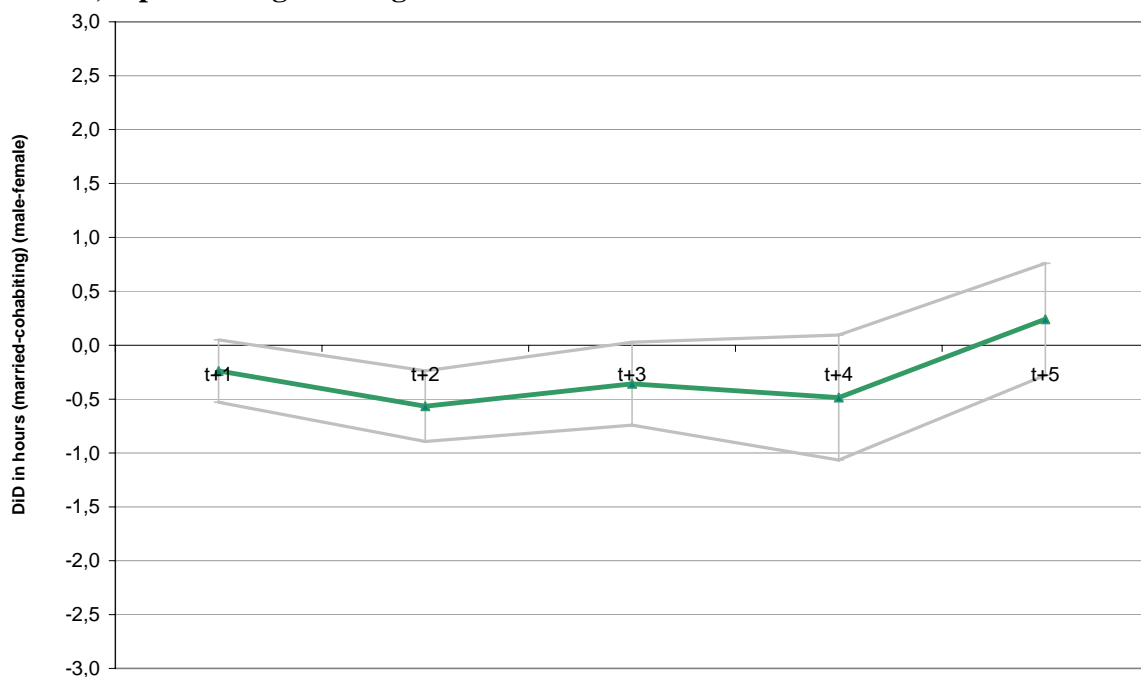
Source: Own calculations based on the Probit estimation results of Table 3 and Stata matching algorithm psmatch2 by Leuven and Sianesi (2003). GSOEP waves 1991 to 2008. Standard errors obtained from bootstrapping with 100 replications.

In contrast to this, the ATTs on specialization in house work, errands, repairs and gardening, remain more or less statistically insignificant over the years. Only in t+2, two to three years after

¹⁶ Going beyond t+5 would result in the loss of even more observations.

marriage the specialization gap between married and cohabiting couples seems to increase slightly and becomes significant, at least statistically. Economically the difference does not seem very relevant, as married couples exhibit only a half an hour larger gap in household activities between husband and wife than cohabiters.¹⁷

Figure 3: ATT on intra-couple time use difference for weekday hours spent on house work, errands, repairs and gardening

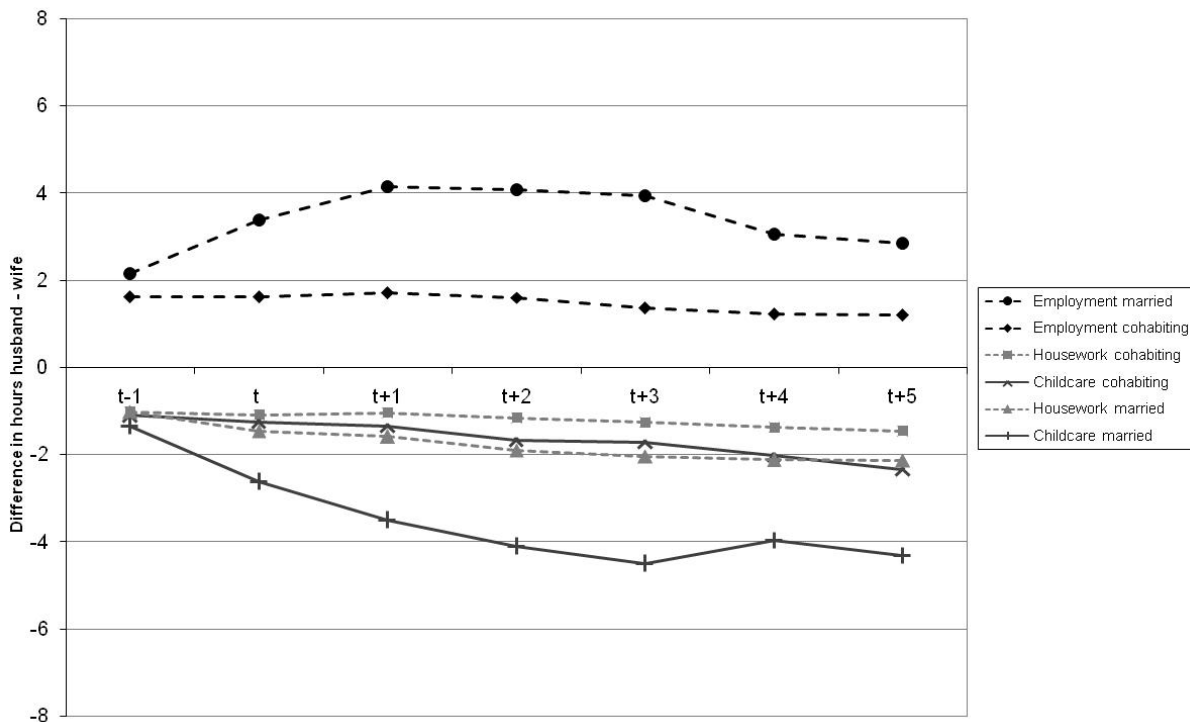


Source: Own calculations based on the Probit estimation results of Table 3 and Stata matching algorithm psmatch2 by Leuven and Sianesi (2003). GSOEP waves 1991 to 2008. Standard errors obtained from bootstrapping with 100 replications.

Now, to investigate where this increase and later decrease in the net effect of marriage on specialization stem from, we disentangle the ATTs by presenting the intra-couples time use differences in t-1 to t+5 *before* accounting for selection (Figure 4) and *after* controlling for selection into the treatment by matching similar couples (Figure 5).

¹⁷ With the narrow definition of housework the picture looks very similar.

Figure 4: Intra-couple time use differences, unmatched samples

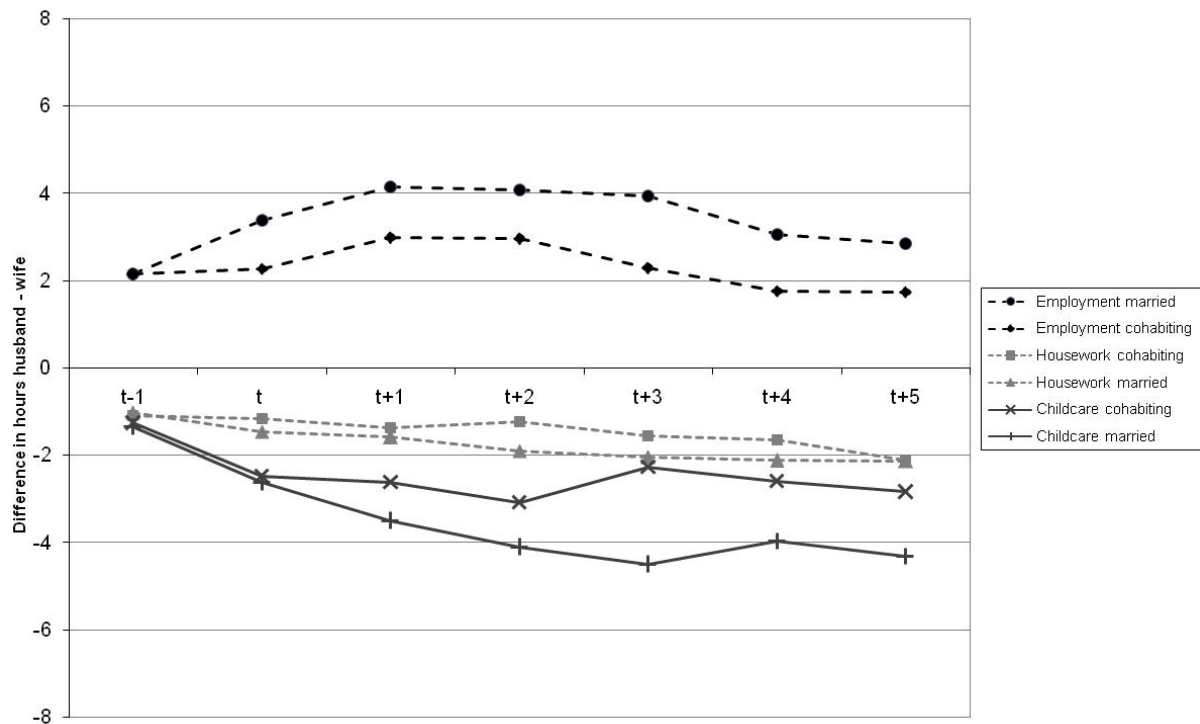


Source: Own calculations based on GSOEP waves 1991 to 2008.

Starting from a rather low level of two-hours difference in time spent on employment and 1.3-hours difference in time spent on child care in the survey year before marriage takes place (in $t-1$), couples seem to specialize further once being married. In the three to four subsequent years to marriage husbands invest four hours more time in their jobs per day than wives. This difference is exactly reflected in the child care gap, where married women invest between 3.5 and 4.5 more daily hours in the years following marriage. However, while the employment time gap falls below three hours in $t+5$, the child care gap remains at and above four hours. The time differential in housework, errands, repairs and gardening increases steadily to more than two hours that married women spent more than married men. In contrast to this, cohabiting couples, exhibit a much more constant time use pattern. The employment differential remains at 1.2 to 1.7 hours over the whole observation period. The housework differential increases slightly from 1 to 1.5 hours. Solely child care seems to be provided to a larger extent by cohabiting women than

men over the course of time, the gap growing from 1 to 2.3 hours – though still being far below the gap exhibited by married spouses.

Figure 5: Intra-couple time use differences, matched samples



Source: Own calculations based on the Probit estimation results of Table 3. GSOEP waves 1991 to 2008.

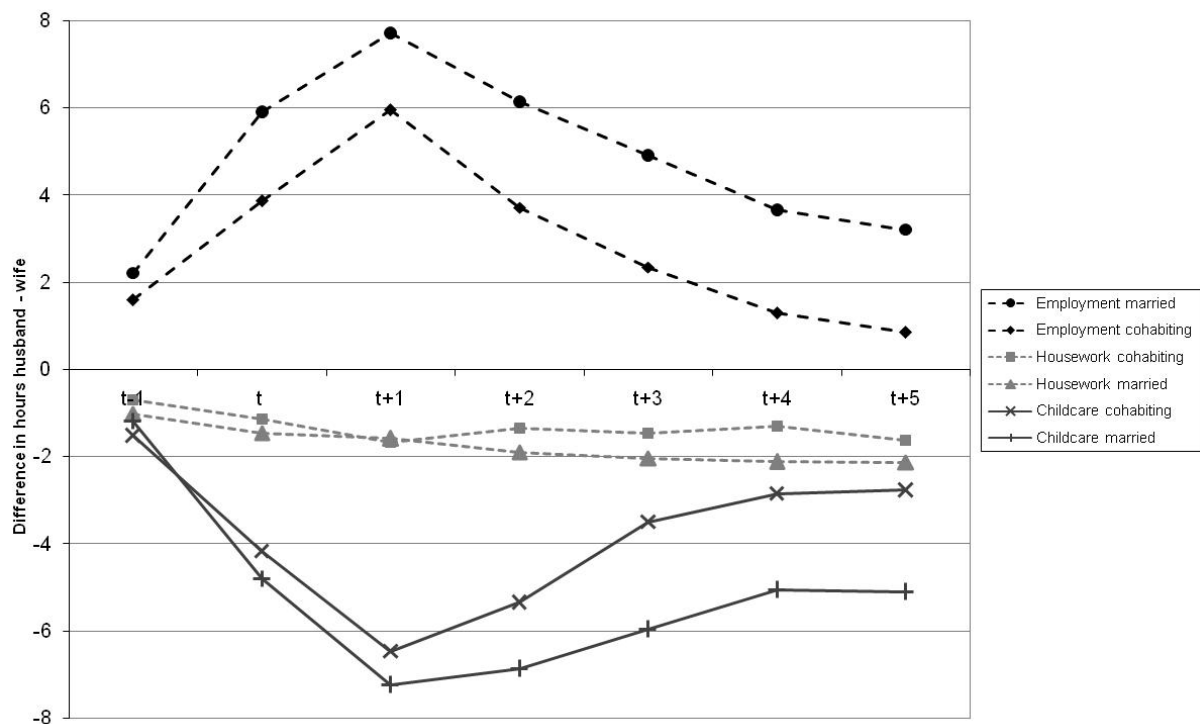
When restricting the comparison to couples who are actually included as control units in the matched sample, and using their sample weights from the matching procedure¹⁸, the picture changes (see Figure 5). The curves for cohabiting spouses now look more similar, in level as well as pattern, to the ones for married couples (which remain the same as in Figure 4)). The differential in employment hours between cohabiting women and men in particular becomes more similar to the differential between married spouses, although it is still more than one hour smaller. The child care and housework gaps also have a more similar pattern, the former

¹⁸ For this illustration, the weights of the nearest neighbour matching are used.

particularly in the sub-period t to $t+2$. Despite this convergence in time use differentials due to the selection correction, there remain notable differences between the matched samples (as already seen with the dynamics of the ATTs) which may give interpretative scope for a specialization-reinforcing effect of marriage.

It may be objected, that couples often get married when (or because) they expect a child or are planning to have a child and that marriage can therefore not be analyzed independently of child birth. In addition to taking account of the event of a child birth in the propensity score estimation, we therefore investigate the robustness of our results with a subsample of couples who have a child born in t or $t+1$ (around marriage).

Figure 6: Intra-couple time use differences, child birth samples



Source: Own calculations based on the Probit estimation results of Table 3. GSOEP waves 1991 to 2008.

Interestingly, the graphs of married and cohabiting couples' time use gaps resemble even more if we condition the comparison to couples who experience a child birth, as illustrated in Figure 6. Both, the employment gap and the child care gap increase substantially after child birth and have a peak at $t+1$ which amounts to 7.7 job hours respectively 7.3 child care hours between married spouses and 6 job hours respectively 6.5 childcare hours between cohabiting spouses. However, the long-run patterns differ by family status. Approximately four years after child birth, the employment differential of cohabiters falls even below the pre-birth level. As regards time spent on child care, their gap drops below 3 hours whereas for married couples it remains above 5 hours.¹⁹

In summary, we interpret the persistently different time use decisions within married and cohabiting couples as an indication for a specialization-reinforcing effect of the institutional framework for marriage. Alternatively, this finding may indicate a couple's 'doing family'-behavior once married. However, this effect does not increase with marriage duration, except for the subsample of parents: Although the time use patterns of married and cohabiting couples are much more similar after a child has been born, married couples still exhibit larger differences, hence more specialization, particularly after the child's infant and toddler years.

8 Conclusion

The novelty of our paper lies in investigating the selection into marriage of couples who are willing and likely to specialize in time use and in emphasizing the specialization-reinforcing effects of the institutional framework of marriage versus cohabitation in Germany. To the best of our knowledge, non-parametric matching has not been applied yet to test selection into specialization within marriage.

¹⁹ One may object that married couples tend to have more children than cohabiting ones and, hence, the remaining higher level of specialization of the married couples could be due to further children being born between $t+2$ and $t+5$. For a sensitivity analysis and in order to check the effect of additional children, we restricted the samples to those couples who had no children before, and who experienced no further child birth. With regard to the cohabiters, we restricted the sample to those couples who remained unmarried during the observation period. The resulting time use patterns differ even more sharply between the two groups (based on very small sample sizes though). The results are available from the authors on request.

Our analyses show that even recently married couples in Germany reveal more intra-household specialization in time use than cohabiting couples. Different behavior is observed for all major time uses - employment, housework and child care. With PS matching, however, we can show that the average treatment effect of marriage for the married decreases by two thirds of the difference in time spent on child care between married and cohabiting couples and by more than half of the differences in employment and housework. In other words, married couples have larger time use differences mostly because they have a specific mix of characteristics, even before marriage, and because they become parents at a much higher probability. In contrast to this, more homogenous spouses in terms of education, wage income and time use are less likely to get married. This result not only supports our selection hypothesis, it also gives grounds to the previous finding of a virtually non-existing wage differential (when accounting for selection) between married and cohabiting men (Barg and Beblo 2009). The results of the present paper confirm that specialization plays a particularly important part in the selection process from cohabitation to marriage – at least in a country like Germany where institutions impose strongly different incentives depending on the family status.

However, even though selection into specialization tells most of the story, we cannot reject a reinforcing effect of marriage. Particularly when having a child, husbands' and wives' time uses tend to deviate the more from those of cohabiting spouses, the more time elapses since child birth. Whereas cohabiting parents' work division converges to the pre-birth level after a couple of years, married parents remain rather specialized.

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