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Does marriage pay more than cohabitation?

Selection and specialization effects on male wages in Germany

Katherin Barg and Miriam Beblo

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Abstract

Empirical research has unambiguously shown that married men receive higher wages than unmarried, whereas a wage premium for cohabiters is not as evident yet. Our paper exploits the observed difference between the marital and the cohabiting wage premium in Germany and thus provides new insights into their respective sources, typically explained by specialization (husbands being more productive because their wives take over household chores) or selection (high earnings potentials being more attractive on the marriage market). We analyze the cohabiting and the marital wage premium in Germany using a shifting panel design for marriages and move-ins from 1993 to 2004 in the German Socio-Economic Panel. With non-parametric matching models we match men who get married (treatment group I) with cohabiting or single men (control groups) and men who move in with a partner (treatment group II) with singles. Matching reveals that higher wages are mostly due to positive selection – into marriage as well as into cohabitation. Supplementary analysis of intra-household time use suggests that specialization, if any, is part of the selection process from single to cohabitation to marriage.

JEL Classification: J12, J31

Keywords: marital wage premium, cohabitation, matching approach

1   Introduction

Married men receive higher wages than unmarried. Whereas this marital wage premium (MWP) has been shown in basically every country study, the existence of a cohabiting wage premium (CWP) is not so evident, yet. According to the German Socio-Economic Panel (GSOEP) e.g., a man who got married in the preceding year receives a 13 percent higher wage rate than a man who stayed single (Barg / Beblo 2007). Based on the same data set, moving in with a partner leads to a comparatively smaller premium of 6.7 percent in the subsequent year.[1] In this paper we exploit the observed difference between the cohabiting and the marital wage premium to draw conclusions about their respective sources (specialization versus selection). A second and related question concerns the relative importance of the legal framework for marriage and cohabitation on couples' time use arrangements.

Regarding the sources of the MWP, we can distinguish two main hypotheses in the literature: the specialization or productivity hypothesis and the selection hypothesis.[2] The specialization hypothesis postulates that married men tend to have more time and energy to invest in their job than unmarried men because their wives can "back them up" on all remaining chores. Traditional division of household responsibilities between husbands and wives makes married women take over the main part of household production, including child rearing, and gives their spouses the chance to be more productive in the labor market (Becker 1985). This reasoning includes a potentially higher sense of responsibility of married men to take care for their families financially. Empirical evidence for the specialization hypothesis is provided among others by Kenny (1983) who concludes that married men accumulate human capital more rapidly, as well as Korenman and Neumark

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[1] Both averages are based on data from the interview years 1994 to 2005 and refer to dependently employed men (only private sector for the married).

[2] Alternative explanations for the MWP, yet more difficult to distinguish empirically from the mentioned two, include employer favoritism for married employees (Hill 1979) and compensating wage differentials where married men have higher wages because they take jobs with fewer amenities and non-pecuniary rewards (Reed / Harford 1989).

(1991), whose results based on a US company personnel file show a faster wage growth after marriage. By integrating the wife's labour market hours in the analysis, Chun and Lee's study (2001) reveals marriage wage gains to be explained by the degree of specialization within the household. Antonovics and Town (2004) uncover a MWP even for monozygotic twins. Kermit (1992) presents evidence that marriage makes men more productive as the input of the spouse's time enhances productivity augmentation. A study by Mamun (2005) provides empirical support for intra-household spillover effects of the partner's education.

The second explanation for the MWP proceeds on the assumption that men with higher (potential) wages are more likely to get married than men with lower income prospects. This selection can work either directly through women preferring men with higher wages or indirectly through characteristics that are valuable for both, the marriage market and the labor market (Becker, 1981). Empirical evidence for selection to explain at least part of the wage premium can be found in Nakosteen and Zimmer (1997), Breusch and Gray (2004), Datta Gupta, Smith and Stratton (2005), Ginther and Zavodny (2001). According to Nakosteen and Zimmer (1997), US men with higher earnings are more likely to marry and less likely to divorce. Using Australian data Breusch and Gray (2004) find similar wage levels for married and cohabiting men but higher earnings for ex-married in comparison to never-married men. According to Datta Gupta, Smith and Stratton (2005) the marital premium diminishes after controlling for individual fixed effects – another support for the selection hypothesis. However, by focussing on shotgun weddings, which they assume to be uncorrelated with earnings ability Ginther and Zavodny (2001) find little evidence for selection.

In view of these rather heterogeneous research results on its sources, the MWP seems to have remained a puzzle in the economic literature. Our paper provides further pieces to solve this puzzle. We start with the question, whether the selection and specialization hypotheses apply to cohabiting couples in the same way as they work for married. On one hand, it could be argued, that both selection and specialization should be prevalent at the

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time of moving in with somebody regardless of the legal status of the relationship. On the other hand, differences in the legal status of cohabitation and marriage still exist in most countries. Institutional settings such as joint income taxation for married couples, the entitlement for maintenance payments after split up, inheritance regulations and widows' or widowers' pensions may create differing incentives for married and cohabiting couples to engage in household specialization. As Ginther, Sundström and Björklund (2006) point out for Sweden, cohabiting couples may face a lower commitment level which translates into a shorter expected duration of the relationship. In addition, incentives to marry for different groups are also affected by the legal framework, so that, as a result, married and cohabiting couples might differ systematically. Accordingly, most comparative empirical evidence confirms a larger WP for marriage than for cohabitation. (see e.g. Stratton 2002, Cohen 2002, Datta Gupta / Smith / Stratton 2005 as well as Ginther / Sundström / Björklund 2006).

While there is a wide range of research on wage premia for the United States, Australia, and several European countries,[3] the relationship of the MWP and the CWP in Germany has not been investigated yet. By use of the German Socio-Economic Panel (GSOEP) we would like to fill the gap and compare the premia for marriage and cohabitation with a non-parametric estimation approach, the so-called matching methodology:[4] That is, to single out selection effects we would ideally like to compare the wage rate of a married or cohabiting man with the wage rate of this same man if he had not formed a partnership (counterfactual situation). As this procedure is obviously not applicable, we have to approximate this counterfactual situation by looking at the wage of a single, but otherwise similar man. Similarity is achieved by conditioning on characteristics that are assumed to have an effect on the family status, also referred to as the treatment status in the matching methodology.

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[3] Apart from those already cited see e.g. the study by Schoeni (1995) and, for the MWP in Germany, Barg and Beblo (2007).
[4] Another application of a matching approach within the context of marriage and wages is provided in a working paper by Maasoumi, Millimet and Sarkar (2005) who investigate the distribution of the MWP in the US.

Using a shifting 3-year panel window on marriages in the GSOEP between 1993 and 2004, men who marry in the reference year (t) and are still married in t+1 are matched with single men who stay unmarried all through from year (t-1) to year (t+1). By holding constant characteristics that might have an impact on both, a man's hourly wage rate as well as his likelihood to get married, we take account of the possible selection of men with high wages into marriage. In this first matching model we hope to detect how much of the MWP can be attributed to the selection hypothesis.

To have a comparative measure of the MWP between married and cohabiting men, we set up a second sampling and matching procedure accordingly. Assuming that potential selection into a relationship and household specialization should apply to married as well as cohabiting men and in light of the different legal treatment of marriage and cohabitation, we expect the wage difference between married men and cohabiters to be of much smaller, but still remarkable, size than the wage difference between married and single men.

In a third matching model we assess the size of the selection effect at the time of moving in with a partner (either instead of or prior to getting married legally). Here we use the shifting-panel window on move-ins in the GSOEP between 1993 and 2004. Men who report to live in the same household as their partner for the first time in the reference year (t) and still do so in t+1 are matched with single men who live alone all through from year (t-1) to year (t+1). This way, we also take account of the possible selection of men with high wage potentials into cohabitation.

In the next Section we describe potentially wage-related legal differences between married and cohabiting couples in Germany. The econometric 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 estimations and the matched wage differentials of married versus single men and married versus cohabiting men are presented in Sections 5 and 6. In the latter we also compare time use decisions of married and cohabiting couples. The last Section discusses caveats and possible extensions of our approach.

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2 Legal differences

As in most countries, cohabitation and marriage have different legal status in Germany. Particularly the incentives for married and cohabiting couples to engage in intra-household specialization of time use are expected to vary with institutional settings such as joint taxation of married couples or the coverage of a non-employed spouse within the wage earner's public health insurance. Joint taxation of married couples combined with a tax allowance for each partner creates a greater economic incentive for married to specialize in a breadwinner-housewife-type model (or vice versa) than for cohabiting couples. Hence, specialization should be more prevalent in married couples and, as a result, we might expect the MWP to be larger than the CWP. Coverage of the marital partner in the public health insurance provides a similar immediate effect for more specialization within married than cohabiting couples. In comparison, 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 (see Table 1). Other indirect effects leading the MWP to outrage the CWP are created by the regulations for maintenance payments after split up, where the splitting cohabiter is only entitled to receive maintenance support if he or she sacrifices employment for a raising a common child under 3 years of age, and 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, thus, less specialization (as this is a more risky investment for a non-married partner who specializes in housekeeping).

The above-mentioned legal differences between married and cohabiting couples in Germany are listed in Table 1. The fourth column concludes states whether they are related – directly or indirectly – to the size of a potential wage premium.

Table 1: Legal differences between marriage and cohabitation affecting the wage premium

	Married couples	Cohabiting couples	Reason for MWP > CWP
Payment	Pay premium in the public sector	Pay premium in the public sector only if child present	no
Taxation	Joint taxation	Individual taxation	Direct effect
Health insurance	Not employed spouse is covered by (public) health insurance of employed spouse	Individual insurance	Direct effect
Entitlement for social transfers	Parental leave benefit, unemployment benefit means-tested on partner's income	Parental leave benefit, unemployment benefit means-tested on partner's income	no
Paternity	Husband of mother is the legal father	Father has to recognize the child and mother has to agree	no
Custody regulation	Joint custody	Joint custody if both parents agree	no
Maintenance support	Obligation to support spouse	Obligation for support only if the couple has a child under 3 years	Indirect effect
Widow's/widower's pension	Entitlement	No entitlement	Indirect effect
Inheritance regulation	Automatic inheritance (mandatory fraction), high tax exemptions	Written testament required (no mandatory fraction), inheritance tax	no
Dissolution costs	Legal fees depending on income level	No legal costs	Indirect effect

3   Matching approach

The simplest way to assess the wage effect of being married[5] would be to compare the wage rates of married and non-married. This would be a valid approach if married men formed a randomly selected subgroup of all men. However, in face of an observed MWP and according to the selection and specialization hypotheses, individuals neither sort randomly into marriage nor are they equally affected by marriage. Instead, a selection bias may emerge if the likelihood of marriage is related to the wage rate. If men with more favorable labor market characteristics (i.e. who are more likely to experience wage growth)

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[5] For simplicity, in this section the terms married and marriage are used for all household formations, including move-ins.

are also more attractive to women as potential mates, the true wage differential between married and non-married 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 true wage premium 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 wage rate of a married man with the wage rate that would have been realized, had that same man stayed unmarried (Rubin 1974). This yields the average treatment effect on the treated (ATT), an estimate of the average expected effect of marriage on the wage rate for all men who are marrying.

Let Y_{1i} denote the wage rate of a man one year after marriage and let Y_{0i} denote the wage rate of a man who stays unmarried. Then, the ATT is given by:

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

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

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

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

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 individuals 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, men by means of propensity score matching where every person in the treatment group (married) is matched to a comparable control

person from the non-treated group (non-married). The vector *X* includes all variables available that presumably affect the event of marriage while having an influence on the wage level as well.

The first step in selecting comparable individuals, therefore, is to estimate a Probit model of getting married and derive the corresponding propensity score (PS). The intuition behind the PS matching is that individuals with the same probability of "treatment" can be paired for purpose of comparison. In our setting, it describes the likelihood of getting married (or moving in with a partner) in the following year for every man in the sample. In the next step, married men are matched to unmarried based on their estimated probability of belonging to the treatment group, given by the distance metric *PS = P(X)* (Rosenbaum / Rubin 1983). We apply nearest neighbor matching with replacement, where for each married man that one non-married man with the closest *PS* is selected.[6]

4   Data sampling

The data used for our analysis are based on data from several 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.[7] 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 labor market outcome at the same time. Non-married participants in the survey provide information about their living circumstances, such as whether they live alone or with a partner. 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 or move-in within the observation period.

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[6] A detailed discussion of the advantages and disadvantages of different PS matching algorithms can be found in Imbens (2004).
[7] For a detailed description of the data set see SOEP Group (2001).

Figure 1: Sampling procedure
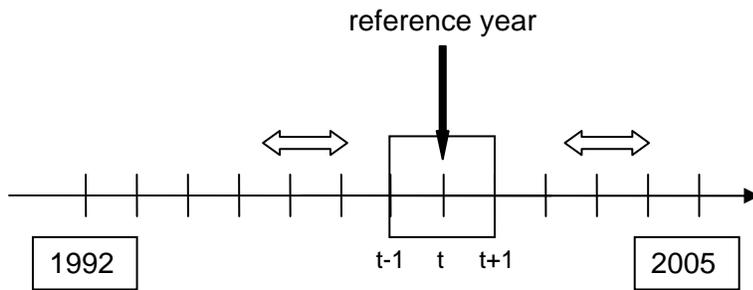
We apply a shifting panel design for marriages (or move-ins) between 1993 and 2004 (as displayed in Figure 1). A panel window of 3 years ensures that we only consider respondents who are observed at most one year before marriage (t-1) and one year following the year of marriage (t+1). Men who have a change in their reported family status from unmarried to married in two subsequent years within the period 1993 to 2004 are labeled as belonging to the treatment group I ("married") of that specific sample year t. Likewise, all men who remain unmarried during the corresponding 3-year window (that is, from t-1 to t+1 around the sample year) qualify for the control groups. There is one control group of singles who report not to live with a partner in either of the years t-1, t or t+1 and another control group of cohabiters who live together with a spouse during that same time period. Divorcees and widowers are not considered in either of the groups. Thus, the first treatment group consists of men who are married in t for the first time and the control groups are formed by men who have never been married in their lives, at least up to t+1.[8]

Our second treatment group ("move-in") includes all those who report to live with a partner in the same household in t and t+1, but did not so in t-1. Naturally, we compare the wages of this second treatment group only to the control group of singles.

In total, by focusing on marriages between 1993 and 2004, we make use of GSOEP data from the years 1992 to 2005. The total number of men marrying over the twelve-year

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[8] Note, that the group of single men is solely defined by not living with a partner. Some of them might have a relationship outside their households, though.

observation period and matching our sampling criteria is 364, the corresponding number of men who move in with a partner is 219.

Table 2: Sampling procedure

Sampling criteria	Remaining numbers of observations			
	Treatment groups		Control groups	
	Marriage in t	Move-in with partner in t	Staying single (from t-1 to t+1)	Cohabiting (from t-1 to t+1)
All men (age 20 to 64) observed from t-1 to t+1	746	493	10,661	2,444
Dependent employees in t+1 (no self-employed, apprenticees etc.)	594	356	6,043	1,714
Among marrying: only private sector employees in t+1 (no public service)	474	356	6,043	1,714
With non-missing values on weekly working hours and monthly wage income in t+1	440	320	5,438	1,566
Dependent employees in t-1	396	244	4,213	1,350
With non-missing values on weekly working hours and monthly wage income in t-1	383	230	4,038	1,286
With non-missing values on explanatory variables	364	219	3,772	1,220

Source: Own calculations based on GSOEP waves 1992 to 2005.

The applied sampling criteria and the remaining numbers of respondents at each step of the sampling procedure are listed in Table 2. Naturally, we consider only men who fall in one of the observation (treatment or control) groups. As our analysis relies on reliable information on individual market wages, we have to restrict our sample to dependent employees and ignore all self-employed, unemployed, students, trainees and individuals in special training programs or national services (military and civil) at the time of the wage comparison (t+1). Another restriction for the married sub-sample regards private-sector employees since paying schemes in the public sector are set up with a build-in marriage premium already, which would bias our results substantially.[9] Finally, we consider only

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[9] Although these family status-related wage components have been abolished now, they still affect the wage data within our observation period.

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employees who report a positive number of contractual working hours per week and positive monthly gross earnings before (t-1) and after (t+1) the reference year. After applying these criteria we are left with observations from 5,526 men, 364 of whom get married, 219 move in with a partner, 3,772 live as singles and 1,220 cohabit.

As hourly wage rates are not observed directly, we construct this variable by dividing current monthly gross wage earnings by the contractual number of working hours.[10] We use the stipulated total number of contractual weekly hours (multiplied by 4.3). To ensure a meaningful comparison of wages from 14 years in total (from 1992 to 2003 for the before-marriage comparison and from 1994 to 2005 for the after-marriage comparison), we convert the nominal numbers into year 2000-prices using the consumer price index and taking account of nominal wage growth.

5   Propensity Score Estimation

Three Probit models are estimated, one for married and single men, one including married and cohabiting and the third one for those who move in versus staying single. According to the CMIA (that selection into marriage/cohabitation is taken up by this set of individual characteristics and any remaining wage difference between treated and non-treated individuals can be attributed to the effect of marriage/cohabitation), 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 the wage level. Due to the longitudinal perspective of our analysis, our choice of variables that might serve as conditioning characteristics for the matching of married/cohabiting and unmarried men is limited. We are restricted to variables gathered every single year over the whole period from 1992 to 2003 (time of matching, t-1). Given, that the numbers of men in our treatment groups are already very limited, we choose that set of variables for the propensity score estimation that allows us to keep the maximum number of observations for the matching

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[10] As wage income variable we use the generated variable labgro$$ provided in the GSOEP.

procedures while leaving a large enough scope for the CMIA to hold. Most importantly, and as part of the socio-economic variables, we use the before-marriage wage rate in t-1. It is meant to cover unobserved factors that may drive a man's earnings potential and, potentially, his attractiveness as a spouse at the same time. To summarize, we distinguish two sets of variables:[11]

- *Socio-economic characteristics* such as age, education, occupational status, tenure, type of job contract, region, nationality, migration status, children and the wage level at t-1.

- *Satisfaction and concern variables* such as satisfaction with several aspects of life (health, income, housing situation, leisure etc.) as well as life in general and concerns about the own and the general economic situation.

The means and standard deviations of all variables included in the PS estimations are given separately for the treated men (married and move-ins) and the control groups (single and cohabiting) in Tables A1 to A3 in the Appendix.

Table 3: Probit estimation results for all matching models

Characteristics in t-1	Matching I: Marriage vs. staying single		Matching II: Marriage vs. cohabiting		Matching III: Moving in with partner vs. staying single	
	Coeff. est.	Std. error	Coeff. est.	Std. error	Coeff. est.	Std. error
Wage rate	**0.0206**	0.0055	0.0088	0.0068	**0.0144**	0.0063
Age 20 to 25 (reference group: 46 to 64 years)	**0.9019**	0.3469	**1.5156**	0.4584	**1.1057**	0.3602
Age 26 to 35	**1.4341**	0.3363	**1.6417**	0.4448	**1.1361**	0.3494
Age 36 to 45	**0.8274**	0.3415	**0.9719**	0.4496	**0.7535**	0.3550
Schooling: medium level, 10 ys secondary schooling (reference group: no degree, 9 ys secondary schooling)	-0.0144	0.0810	-0.0648	0.1014	0.0628	0.0917
Schooling: high school, advanced technical college	0.0873	0.0984	0.0638	0.1187	**0.2511**	0.1087

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[11] More information, e.g. on the health status, would be appreciated but is not available over the whole observation period. The choice of relevant variables is restricted by the common pool of those who are available in each year and for which item non-response is not too severe.

Occupational status: no degree, low skill (reference group: skilled blue collar workers)	0.0247	0.0909	**0.2534**	0.1193	**-0.3584**	0.1248
Occupational status: white collar, medium skill	-0.0388	0.0847	-0.0493	0.1044	-0.0109	0.0885
Occupational status: white collar, high skill	0.0575	0.1090	-0.0325	0.1276	-0.1879	0.1288
Tenure (in years)	**-0.0256**	0.0071	0.0008	0.0089	-0.0149	0.0083
Temporary job contract	**-0.4568**	0.1275	-0.3557	0.1548	0.0039	0.1185
Satisfaction with health status (10 point scale)	-0.0060	0.0206	**0.0572**	0.0251	-0.0330	0.0223
Satisfaction with leisure (10 point scale)	**0.0396**	0.0184	0.0081	0.0212	-0.0092	0.0203
Satisfaction with housing situation (10 point scale)	**-0.0481**	0.0166	0.0033	0.0193	-0.0135	0.0193
Satisfaction with income (10 point scale)	-0.0050	0.0207	0.0399	0.0245	-0.0186	0.0234
Satisfaction with life today (10 point scale)	**0.1242**	0.0329	**0.0889**	0.0406	**0.0882**	0.0359
Satisfaction with life in 5 years, expected (10 point scale)	-0.0039	0.0265	-0.0298	0.0324	-0.0007	0.0305
Worried about own economic situation (3 point scale)	**-0.1542**	0.0585	-0.0762	0.0731	**-0.1712**	0.0664
Worried about general econ. situation (3 point scale)	0.0680	0.0539	0.0910	0.0665	0.1095	0.0602
Worried about job security (3 point scale)	-0.0961	0.0516	-0.0754	0.0640	0.1103	0.0618
Presence of child in the household	**0.4550**	0.0758	**0.2003**	0.0923	0.0437	0.1004
Living in East Germany	0.0057	0.0870	**-0.2711**	0.1078	0.0863	0.0946
Immigrated to Germany	0.2127	0.1262	**0.5604**	0.1828	-0.2936	0.1926
Foreign nationality	-0.1024	0.1189	0.0973	0.1560	-0.0094	0.1456
Constant	-3.0988	0.4255	-3.416	0.5474	-2.9789	0.4452
Pseudo R squared		0.1165		0.0797		0.0625
$\chi^2(24)$		287.20		136.15		106.03
No. of observations		4,136		1,584		3,991

Source: Own calculations based on GSOEP waves 1992 to 2005. Bold coefficients indicate a significance level of 5%.

The estimation results of the Probit models for all three matching procedures are presented in Table 3. Most of the estimated coefficients have the expected signs and sizes. Those for getting married and moving in with a partner have many similarities: First of all, the hourly wage rate (at t-1) is positively related to the likelihoods of getting married or moving in versus staying single but rather unrelated to marrying versus cohabiting. This finding might be interpreted as first evidence for the selection hypothesis, be it because a man's attractiveness on the marriage respectively spousal market rises with his income level or his inclination to marry increases with the financial background. The older a man the less likely he is to couple, with the prime age group for marriage being 26 to 35 and for move-ins being 20 to 35. Whereas higher education is positively related to cohabitation, marriage is significantly more likely among low-skilled men. Years of job tenure and having a fixed-term contract are negatively and the presence of a child in the household is positively correlated with the likelihood of getting married in the following year, but not for moving together. Whether a man lives in the Western or Eastern part of Germany and whether he has immigrated proves statistically significant for marriage only for the alternative of cohabiting but not for staying single since cohabiting is more common in East Germany than in West Germany. Satisfaction with the housing situation as well as concerns about the own economic situation and about job security seem to have a negative impact on changing the family status from single to married in the subsequent year. This goes in line with the finding for having a temporary job contract. A rather strong and positive relationship, confirming recent research results on marriage and happiness by Stutzer and Frey (2006), is found between the individual satisfaction level with life and the propensity to get married or move in with a partner. Finally, satisfaction with leisure is also positively related to subsequent marriage.

Based on the estimated propensity scores, men of the treatment groups "married" and "move-in" are now matched to their nearest neighbors within the control groups. To get an idea of the quality of these matching procedures, Tables A1 to A3 in the Appendix provide test results on the equality of mean characteristics of treated and matched control persons.

6   Matching Results

In the first matching procedure (matching I), an adequate control person for each married man is selected among the singles. The results are presented in Table 4:

The average wage rate of a married man is 15.91 €whereas the unmatched wage of a single amounts to 14.08 €on average. This yields a significant unmatched wage gap of about 1.83 €or 13 percent. After controlling for differences in observed characteristics, the adjusted wage rate of singles rises towards the level of the married (15.70 €). The wage differential falls to 21 cents and is not statistically significantly different from zero any more.[12] Interpreting this ATT of 1.34 percent, a randomly chosen man from the sample of married would not receive a lower wage if he were not married. This result confirms that high-wage men with better paid socio-economic and attitudinal characteristics (particularly higher starting wages) are more likely to marry. Hence, when comparing married to single men, the MWP seems to be fully attributable to a selection process into marriage.

Table 4: Wage differentials between married and single men (Matching I)

	Married (#364)	Singles (#3,772)	Absolute difference (in €)	Relative difference (in %)
Unmatched wage rate in t+1 (T-stat.)	15.91	14.08	**1.83** (5.44)	**13.00**
Matched wage rate, ATT (T-stat.)	15.91	15.70	0.21 (0.37)	1.34

Source: Own calculations based on the Probit estimation results of Table 3 and Stata matching algorithm psmatch2 by Leuven and Sianesi (2003). GSOEP waves 1992 to 2005. Bold numbers indicate a significance level of 5%.

Matching II, of married and cohabiting men, yields slightly different results (see Table 5). Without controlling for differences in observed covariates, married out-earn cohabiters by

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[12] 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 200 replications) for a comparison. The resulting standard error of the ATT is 0.58 which confirms the ATT not to be significantly different from zero.

only 68 cents on average. Moreover, this unmatched MWP is not statistically different from zero at standard levels.

Table 5: Wage differentials between married and cohabiting men (Matching II)

	Married (#364)	Cohabiters (#1,220)	Absolute difference (in €)	Relative difference (in %)
Unmatched wage rate in t+1 (T-stat.)	15.91	15.23	0.68 (1.60)	4.46
Matched wage rate, ATT (T-stat.)	15.91	15.68	0.23 (0.38)	1.47

Source: Own calculations based on the Probit estimation results of Table 3 and Stata matching algorithm psmatch2 by Leuven and Sianesi (2003). GSOEP waves 1992 to 2005. Bold numbers indicate a significance level of 5%.

After balancing the samples with respect to observable characteristics the differential decreases even further to 23 cents, that is, an ATT of 1.47 percent which is also not statistically significant.[13] The matched wage rate of cohabiters rises to 15.68 € indicating that, if anything, within the sample of married and cohabiting men those with a higher paying mix of socio-economic and/or attitudinal characteristics tend to get married. A randomly chosen man from the sample of married would not have received a different wage if he had not married and remained cohabiting.

In Matching III we now compare wages of men who have recently moved in with their partner with those of men who stayed living alone (see Table 6). The results are similar to the findings of Matching I: Move-ins have an average wage rate of 15.01 € and the group of unmatched singles receives 14.08 €. Although this observed CWP is smaller than the raw MWP, it still amounts to significant 0.94 € or 6.7 percent. After controlling for differences in observed characteristics, the wage differential is only 36 cents and not

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[13] Bootstrapping with 200 replications yields an even larger standard error of 0.67 (compared to 0.61 produced by psmatch2).

statistically significant anymore.[14] Interpreting this ATT of hardly 5 percent, a randomly chosen man from the sample of cohabiters would not receive a lower wage if he had not moved in with his partner. This result confirms that high-wage men with better paid socio-economic and attitudinal characteristics (particularly higher starting wages) are not only more likely to marry but also to cohabit without being legally married. Hence, also the CWP seems to be fully attributable to a selection process into cohabitation.

Table 6: Wage differentials between cohabiting and single men (Matching III)

	Moved in with partner (#219)	Singles (#3,772)	Absolute difference (in €)	Relative difference (in %)
Unmatched wage rate in t+1	15.01	14.08	**0.94**	**6.68**
(T-stat.)			(2.20)	
Matched wage rate, ATT	15.01	14.66	0.36	2.46
(T-stat.)			(0.57)	

Source: Own calculations based on the Probit estimation results of Table 3 and Stata matching algorithm psmatch2 by Leuven and Sianesi (2003). GSOEP waves 1992 to 2005. Bold numbers indicate a significance level of 5%.

We may conclude that our econometric results are in strong favor of the selection instead of the specialization hypothesis.[15] On one hand, and as regards the comparison of married and cohabiting couples in particular, one might have expected specialization effects to be of minor importance today. On the other hand, and as we described earlier, institutions in Germany such as joint taxation of married couples, public health insurance coverage and pension regulations provide incentives for intra-household specialization for married couples only. In fact, if we take a closer look at the post-matching time use decisions at *t+1* within the couples of our matching sample II, the percentage of men whose spouses are not gainfully employed is significantly higher among the married than among the cohabiting men – 33 compared to 13 percent (see Table 7). Likewise, the intra-household difference in

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[14] Bootstrapping with 200 replications confirms this finding with a standard error of 0.62.

[15] Sensitivity analyses, where the hourly wage rate is computed using information on actual instead of contractual working hours, confirm these results. The same do analyses with alternative matching procedures such as kernel matching. However, in the latter the wage premium for cohabiters does not fully vanish after matching but remains statistically significant at the 10% level.

working hours (in gainful employment) among married couples more than doubles the difference within cohabiting couples. Married men spend less time on child care and household work than their spouses. The difference is 4.4, respectively 1.9 hours and thereby significantly larger than that between cohabiting women and men. At the same time, married men more often live with a child in the household than cohabiters. Although we do not observe any difference in part-time employment, we interpret these findings as evidence for intra-household time use decisions to differ depending on the legal status of the relationship.[16] However, as neither the MWP nor the CWP proved to be significant once we conditioned on observable characteristics in our matching models, these traces of specialization should not be interpreted as a causal factor for a wage premium but, instead, as being one part of the selection process from single via cohabitation to marriage.

Table 7: Traces of specialization within married and cohabiting couples (based on the matched groups in Matching II: married vs. cohabiting)

	Married	Cohabiting	Test on equal means
Characteristics in t+1	Mean	Mean	T-value
Difference in working hours (male-female)	21.0779	9.7488	-6.10
Difference in time spent on child care (m-f)	-4.4312	-1.9481	4.31
Difference in time spent on housework (m-f)	-1.9116	-1.0718	2.98
Partner not employed (m-f)	0.3277	0.1320	-4.45
Partner in part-time employment (m-f)	0.1192	0.1200	-0.04
Presence of a child in the household	0.4943	0.2940	-5.96
Observations	215-235	167-187	

Source: Own calculations based on GSOEP waves 1992 to 2005.

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[16] Note, that these numbers have to be interpreted with caution due to a missing value problem on the spouses' side. As soon as we investigate their labour market participation status or any other variable related to the specialization question, the sample reduces to about 60 percent of the original size.

7   Discussion

Recently married men in Germany receive on average 13 percent higher wages than single and 4.5 percent higher wages than cohabiting men. With PS matching we can show that the average treatment effect of marriage for the married is not statistically significant. In other words, married men have higher wages because they have a more favorable mix of characteristics, even before marriage, and high-income men with a higher wage potential are more likely to get married. This result in support of the selection hypothesis is particularly convincing in light of the virtually non-existing wage differential between married and cohabiting men. There seems to be a selection process into living together with somebody regardless of the legal status. By investigating the premium for cohabitation, our analysis provides even further support for this conclusion: men who moved in with their partner receive 6.7 percent higher wages than singles on average. Matching reveals that also this premium can be fully attributed to selection. Although we find intra-household specialization to be more prevalent in married than in cohabiting couples, just as suggested by the differences in the legal framework, this does not show off in a wage premium, once we condition on observed characteristics. We conclude that specialization should not be interpreted as a causal factor for a wage premium but as being part of the selection process from single via cohabitation to marriage.

Though we think the application of a non-parametric estimation method within the context of marriage and wages the most promising way to go, there are still a few caveats to overcome and possible extensions to be mentioned: First, our analysis focuses on men who are employed prior to marriage (respectively the reference year) and does not include marrying students, unemployed etc. which may give rise to additional selection. As marriage has been shown to be positively related to job security, we argue that this possible selection bias would add even further to the positive selection effect investigated in the paper. Employed men may be more likely to marry and not (yet) employed men to

postpone marriage until their career has started. In this case, our results would even tend to underestimate the full selection effect.

Second, the sorting of men into marriage or cohabitation may be based on observable as well as unobservable characteristics. With regard to the effect of observables we hope to have covered most of the sorting process by applying non-parametric matching to married and non-married men conditional on a wide range of characteristics. However, men might be more likely to find a spouse not only because of their human capital and other observable endowments but because of other (unobserved) traits that affect both marriage and labor market outcome. As we argue above, at least part of this selection on unobservables will be taken care of, as long as it is related to earnings before marriage, by including the wage at *t-1* into the propensity score estimation. A methodological alternative to our approach would be the application of a switching regression model, with endogenous marital selection that incorporates a covariance structure between unobserved earnings capabilities and unobserved traits valued by potential mates (following Chun and Lee 2001). However this methodology builds on an appropriate exclusion restriction that is not easy to find in the existing data.

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Appendix

Table A1: Mean characteristics of treated and matched vs. unmatched control persons (Matching I: married vs. single)

	Married	Singles		Diff. between matched groups
	Matched	Matched	Unmatched	T-value
Wage rate in t+1	15.9123	15.7015	14.0750	-0.95
Characteristics in t-1				
Wage rate	14.9060	15.1980	13.5600	-0.03
Age	29.3983	29.6291	31.7110	0.54
Schooling: no degree, secondary school	0.3077	0.3324	0.3444	0.93
Schooling: o-level	0.3269	0.3187	0.3767	0.03
Schooling: high school, advanced technical college	0.3159	0.3214	0.2444	-0.34
Occupational status: no degree, low skill	0.1648	0.1868	0.1718	1.05
Occupational status: skilled blue collar workers	0.2143	0.1951	0.2397	-0.31
Occupational status: white collar, medium skill	0.2143	0.2390	0.1400	-0.22
Occupational status: white collar, high skill	0.4066	0.3791	0.4486	-0.38
Tenure (in years)	4.8585	5.0236	7.0240	0.48
Temporary job contract	0.0495	0.0522	0.0899	0.11
Satisfaction with health status (10 point scale)	7.896	7.9093	7.6355	-0.41
Satisfaction with leisure (10 point scale)	7.426	7.4011	7.2022	0.02
Satisfaction with housing situation (10 point scale)	6.7033	6.7637	6.9870	0.60
Satisfaction with income (10 point scale)	6.8077	6.8544	6.6508	-0.05
Satisfaction with life today (10 point scale)	7.6346	7.6648	7.2542	0.37
Satisfaction with life in 5 years, expected (10 point scale)	7.8077	7.8324	7.4793	0.36
Worried about own economic situation (3 point scale)	1.8407	1.91209	1.8391	1.76
Worried about general econ, situation (3 point scale)	2.1538	2.1676	2.2211	0.38
Worried about job security (3 point scale)	2.3049	2.3379	2.3627	0.50
Presence of child in the household	0.2582	0.2610	0.1304	0.29
Living in East Germany	0.1978	0.1511	0.2198	-1.51
Immigrated to Germany	0.1044	0.1209	0.0851	0.67
Foreign nationality	0.1154	0.1346	0.1066	0.66
Observations	364	323	3,772	

Source: Own calculations based on GSOEP waves 1992 to 2005.

Table A2: Mean characteristics of treated and matched vs. unmatched control persons (Matching II: married vs. cohabiting)

	Married	Cohabiting		Diff. between matched groups
	Matched	Matched	Unmatched	T-value
Wage rate in t+1	15.9123	15.6841	15.2260	-0.60
Characteristics in t-1				
Wage rate	14.9060	14.7964	14.3828	-0.33
Age	29.3983	29.6346	31.0524	0.79
Schooling: no degree, secondary school	0.3077	0.3517	0.2631	0.84
Schooling: o-level	0.3269	0.3379	0.4107	0.58
Schooling: high school, advanced technical college	0.3159	0.2885	0.3066	-0.90
Occupational status: no degree, low skill	0.1648	0.2006	0.1172	0.42
Occupational status: skilled blue collar workers	0.2143	0.2528	0.2393	0.44
Occupational status: white collar, medium skill	0.2143	0.1786	0.2164	-0.51
Occupational status: white collar, high skill	0.4066	0.3681	0.4270	-0.25
Tenure (in years)	4.8585	4.8684	5.4656	0.25
Temporary job contract	0.0495	0.0467	0.0820	-0.29
Satisfaction with health status (10 point scale)	7.896	7.8764	7.3991	-0.20
Satisfaction with leisure (10 point scale)	7.426	7.5110	7.1672	0.18
Satisfaction with housing situation (10 point scale)	6.7033	6.7747	6.4221	-0.36
Satisfaction with income (10 point scale)	6.8077	6.7995	6.3320	-0.80
Satisfaction with life today (10 point scale)	7.6346	7.6813	7.2172	0.08
Satisfaction with life in 5 years, expected (10 point scale)	7.8077	7.8571	7.5189	-0.31
Worried about own economic situation (3 point scale)	1.8407	1.8929	1.7959	0.39
Worried about general econ, situation (3 point scale)	2.1538	2.1676	2.1475	-0.66
Worried about job security (3 point scale)	2.3049	2.3242	2.2975	-0.81
Presence of child in the household	0.2582	0.2637	0.2352	0.03
Living in East Germany	0.1978	0.1813	0.3107	-0.69
Immigrated to Germany	0.1044	0.0769	0.0402	0.66
Foreign nationality	0.1154	0.1209	0.0697	1.30
Observations	364	269	1,220	

Source: Own calculations based on GSOEP waves 1992 to 2005.

Table A3: Mean characteristics of treated and matched vs. unmatched control persons (Matching III: move-in vs. single)

	Moving in with partner	Singles		Diff. between matched groups
	Matched	Matched	Unmatched	T-value
Wage rate in t+1	15.01329	14.6567	14.0750	-0.50
Characteristics in t-1				
Wage rate	14.1043	14.2724	13.5600	0.20
Age	28.4338	28.5662	31.7110	0.11
Schooling: no degree, secondary school	0.2648	0.3059	0.3444	0.68
Schooling: o-level	0.3836	0.3516	0.3767	-0.61
Schooling: high school, advanced technical college	0.3425	0.3379	0.2444	0.07
Occupational status: no degree, low skill	0.0731	0.1142	0.1718	1.61
Occupational status: skilled blue collar workers	0.2968	0.2603	0.2397	-0.85
Occupational status: white collar, medium skill	0.1553	0.1461	0.1400	0.03
Occupational status: white collar, high skill	0.4749	0.4795	0.4486	-0.22
Tenure (in years)	4.852	4.6014	7.0240	-0.61
Temporary job contract	0.1005	0.1005	0.0899	0.14
Satisfaction with health status (10 point scale)	7.6484	7.3105	7.6355	-1.24
Satisfaction with leisure (10 point scale)	7.0959	6.8904	7.2022	-0.68
Satisfaction with housing situation (10 point scale)	6.8356	6.7352	6.9870	-0.18
Satisfaction with income (10 point scale)	6.6027	6.5251	6.6508	-0.12
Satisfaction with life today (10 point scale)	7.4566	7.2922	7.2542	-0.84
Satisfaction with life in 5 years, expected (10 point scale)	7.7078	7.5434	7.4793	-0.93
Worried about own economic situation (3 point scale)	1.8950	1.9041	1.8391	0.09
Worried about general econ, situation (3 point scale)	2.1964	2.1918	2.2211	-0.19
Worried about job security (3 point scale)	2.4566	2.5160	2.3627	0.38
Presence of child in the household	0.1370	0.1461	0.1304	0.02
Living in East Germany	0.2374	0.2146	0.2198	-0.38
Immigrated to Germany	0.0320	0.0274	0.0851	-0.21
Foreign nationality	0.0776	0.0776	0.1066	0.12
Observations	219	165	3,772	

Source: Own calculations based on GSOEP waves 1992 to 2005.