Marriage and Wages

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BHPS data are available from the Data Archive at the University of Essex
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Further information about the BHPS and other longitudinal surveys can be obtained by telephoning +44 (0) 1206 873543.

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ABSTRACT

This work investigates the commonly observed relationship between marriage and wages among men in Britain using panel data covering the 1990s. We explicitly test several hypotheses developed in the literature to explain this relationship, including the household division of labour and specialisation, differential rates of human capital formation, employer favouritism, and self-selection. After accounting for individual-specific time-invariant effects, and a wide range of individual, household, job and employer related characteristics, we find a small but statistically significant premium remains that can be attributed to productivity differences. Our estimates provide evidence for the existence of a large selection effect into marriage based on both observable and unobservable characteristics that are positively correlated with wages (consistent with employers using marriage as a positive signal), and also evidence in support of the specialisation hypothesis.

NON-TECHNICAL SUMMARY

Much research in applied economics has commented on the advantages associated with marriage. Marriage has been found to have positive effects both on reported levels of happiness and health. In addition, a male marriage premium is a common finding in wage equations, indicating that marriage is associated with higher wages for men. However, there is the question of causality – does marriage itself make men more productive and therefore increase their earnings? Or alternatively do more productive, higher earning men get married? If marital status is genuinely productivity enhancing, then changes in the marital status composition of the workforce will affect productivity. If there are no productivity effects of marriage, then changes in the marital status composition of the workforce will have no impact on economic output. In this paper we investigate in detail the presence and causes of a marriage wage premium among men in Britain using panel data from the first eleven years of the British Household Panel Survey (BHPS), covering the period 1991–2001. We explicitly test several hypotheses developed in the literature to explain the relationship between marriage and wages.

By using panel data we are able to allow for possible correlations between unobserved characteristics, marriage and wages. Failure to do so will bias the coefficient of interest – some of the returns attributed to marriage may actually be returns to some unobserved qualities correlated with marriage. If so, the observed wage premium associated with marriage largely reflects unobserved individual characteristics that are also valued by the employer. Our work provides new evidence on the existence and causes of the marriage wage premium among married men in Britain by using a long run of panel data.

Cross-sectional analysis yields a wage premium for married men of about 15%, consistent with much of the previous literature. Using panel data and panel data methods, we find that this premium falls dramatically, indicating that about three-quarters of the observed premium in cross-sectional analysis is caused by unobserved individual heterogeneity and/or selection effects. Married men have unobserved characteristics that are also correlated with wages. Our results are consistent with the hypothesis that employers use marriage as a signal – a large proportion of the marriage premium is due to unobservable characteristics that are valued both by wives and by employers, such as motivation, loyalty, dependability and determination. Nevertheless, a relatively small but statistically significant marriage premium remains even when allowing for a wide range of individual, household, job and employer-related characteristics and time invariant individual specific unobservable effects. Our preferred panel estimates indicate the size of this premium increases with the number of domestic chores for which the spouse is mostly responsible, and falls with the wife's working hours. The relative sizes of the coefficients suggest that a married man whose wife does not work but whose wife is mostly responsible for four domestic chores enjoys a wage premium of about 4% relative to a single never married man. However this premium almost disappears if the wife also works 40 hours per week in the labour market. We show that the effects of the hours worked and domestic chores carried out by the wife are genuine, and not due to the potential endogeneity of the wife's decision to work. Our estimates therefore provide some evidence in favour of the specialisation explanation for the enhanced productivity of married men.

Introduction

Much research in applied economics has commented on the advantages associated with marriage. Marriage has been found to have positive effects both on reported levels of happiness (Myers 1999; Diener et al 2000; Stutzer and Frey 2003; Blanchflower and Oswald 2004) and health (Ross et al 1990; Waite and Gallagher 2000; Wilson and Oswald 2002; Ribar 2004). In addition, a male marriage premium is a common finding in wage equations, indicating that marriage is associated with higher wages for men (Korenman and Neumark 1991; Schoeni 1995; Loh 1996; Chun and Lee 2001; Ribar 2004). However, there is the question of causality – does marriage itself make men more productive and therefore increase their earnings? Or alternatively do more productive, higher earning men get married? If marital status is genuinely productivity enhancing, then changes in the marital status composition of the workforce will affect productivity (Korenman and Neumark 1991). If there are no productivity effects of marriage, then changes in the marital status composition of the workforce will have no impact on economic output. In this paper we investigate in detail the presence and causes of a marriage wage premium among men in Britain using panel data from the first eleven years of the British Household Panel Survey (BHPS), covering the period 1991–2001. We explicitly test several hypotheses developed in the literature to explain the relationship between marriage and wages.

Previous research has reported large wage premiums associated with marriage, varying between 10% and 40% in cross-sectional studies (Korenman and Neumark 1991, Schoeni 1995). Studies that use panel data typically report that this premium is considerably reduced, if not eradicated altogether, when allowing for individual specific fixed effects (Korenmen and Newmark 1991; Cornwell and Rupert 1995; Jacobsen and Rayack 1996; Stratton 2002). This indicates that at least part of the premium is related to unobserved characteristics of the worker. Studies focussing on men in Britain report a marriage premium ranging from 10% to 14%, although the majority of these use cross-sectional data (Greenhalgh 1980; Schoeni 1995; Disney and Whitehouse 1996). Exceptions are Joshi and Newell (1989), who use birth cohort data and report a wage premium of about 10% for married men, and Davies and Peronaci (1997). The latter study uses data from the first four years of the British Household Panel Survey, and finds that the size of premium falls dramatically when allowing for time invariant individual specific effects. We build on this earlier work, having the advantages of access to

panel data over a longer period and many more control variables including very rich sets of individual, employer, and job characteristics.

There are a number of possible explanations for why married men earn should more than their unmarried counterparts, some of which emerge directly from economies of scale and specialisation within the family (Becker 1973; 1974; 1991). Marriage facilitates the specialisation of labour and traditionally results in the husband becoming market intensive. Increased specialisation in the labour market enhances a man's productivity that translates into higher wages. A number of previous studies find evidence in favour of this specialisation hypothesis (Daniel 1992; Gray 1997; Chun and Lee 2001), while others find evidence against it (Davies and Peronaci 1997; Loh 1996).

It is possible that marriage creates conditions under which the accumulation of human capital is more efficient than as an unmarried worker. It may increase the time available to invest in market specific human capital, or the wife may contribute directly to the husband's human capital by supplying a flow of services. US evidence suggests that married men are more likely to receive work-related training and accumulate human capital at a faster rate (Loh 1996). If this marriage induced human capital accumulation translates into higher wages and faster wage growth, then married men will exhibit a wage premium (Nakosteen and Zimmer 1987; Stratton 2002). However, previous evidence suggests that this is not the cause of the marriage premium among British men (Davies and Peronaci 1997).

A marriage wage premium can also result from employer discrimination, which may or may not reflect higher productivity. For example, employers may discriminate in favour of married men not because of higher productivity but because they conform to a social norm that men should be married and supporting families (Loh 1996; Davies and Peronaci 1997). Employers may be paternalistic in supporting men with families and may be particularly supportive of men whose wife does not work in the labour market. Employers may also use marriage as a signal for higher productivity, as marriage is associated with highly valued unobservable characteristics such as ability, honesty, loyalty, dependability and determination. The latter has

found some empirical support in the US literature (Korenmen and Neumark 1991; Cornwell and Rupert 1995; Loh 1996).[1]

A final and related explanation is that the observed marriage wage premium is a statistical artefact. The positive selection of high wage males into marriage creates an appearance of a marriage premium in observed earnings (Nakosteen and Zimmer 1987; Gray 1997; Davies and Peronaci 1997). Men that possess attributes rewarded in the labour market are also valued in the marriage market – men with wage enhancing unobserved characteristics are selected into marriage. Again, there are empirical studies that produce evidence both in favour (Nakosteen and Zimmer 1987; Jacobsen and Rayack 1996; Davies and Peronaci 1997) and against (Korenmen and Neumark 1991; Chun and Lee 2001) the selection and unobserved heterogeneity hypothesis.

In this paper, we use panel data to test these various explanations for why the earnings of married men exceed those of otherwise similar unmarried men. By using panel data we are able to allow for possible correlations between unobservables, marriage and wages. Failure to do so will bias the coefficient of interest – some of the returns attributed to marriage may actually be returns to some unobserved qualities correlated with marriage. If so, the observed wage premium associated with marriage largely reflects unobserved individual characteristics that are also valued by the employer. Our work provides new evidence on the existence and causes of the marriage wage premium among married men in Britain by using a long run of panel data.

Data

Our analysis uses data from the British Household Panel Survey (BHPS). Since 1991, this has interviewed on an annual basis a representative sample of 5,500 households containing approximately 10,000 individuals. These same individuals are re-interviewed each year on a wide range of subjects including basic demographics, household composition and circumstances, employment status and recent employment history, job characteristics if employed, income from all sources and so on. Currently eleven years of data are available,

[1] It is also possible that married men, especially those with families, choose jobs with fewer non-monetary benefits but that offer higher wages (Reed and Hartford 1989). We do not test this compensating wage

covering the period 1991-2001. The use of panel data is important in our context, as it allows us to examine how wages of individuals change as they change marital status and to allow for time invariant unobserved individual specific effects. These may be correlated with both the probability of marriage and wages and therefore bias the coefficients of interest.

We restrict our analysis to men aged between 18 and 59 (inclusive), who report being in full-time work as their main status. We select only men who were full respondents and were part of the core BHPS sample.[2] Ethnic minorities, those in the armed forces and those with second jobs are also excluded. The hourly wage we use as the dependent variable is constructed from respondents reported usual gross income from their main job and their reported weekly hours of work.[3] This is expressed in real terms, deflated to January 2002 prices.

We focus only on employees, because the inclusion of self-employed workers in our sample is problematic for several reasons. First, almost one half of the self-employed did not respond to the earnings question and had their earnings imputed (in contrast to only 7% of employees).[4] Second, it is well documented that the self-employed have a tendency to under-report their earnings. Third, income from self-employment includes returns from both labour and from physical capital. Fourth, the number of hours worked in a normal week is likely to be more unreliable for the self-employed than employees.[5] Selection based on these criteria (and dropping observations with missing information) results in a sample of 3656 men contributing 16857 person-year observations.

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hypothesis explicitly, but instead control for a wide range of individual, job and employer characteristics that either directly or indirectly capture non-pecuniary compensation.

[2] The original core BHPS sample has been boosted at various stages to include, for example, the UK European Household Community Panel sample, and Welsh, Irish and Scottish booster samples. We exclude these booster samples from our analysis. We have also re-estimated our models focusing on men aged less than 40 who are most at risk of marriage. The results from doing so are qualitatively unchanged from those discussed herein.

[3] One drawback with the earnings data in the BHPS is that the question about usual earnings asks for gross pay including overtime, bonuses, commission etc, and it is therefore not possible to calculate a measure of 'basic pay'. We overcome this to some extent by assuming that a wage premium of 50% is received for any paid overtime hours worked by the individual. Our results are robust to varying this assumed overtime rate.

[4] We have kept those with imputed earnings in our estimating sub-sample, although our results are robust to their exclusion.

[5] An additional complication for the self-employed is that they are allowed to report their earnings either before or after income taxes and other deductions. Although the majority report pre-tax gross earnings, a non-negligible minority report earnings at different stages of the taxation process. Simulations are used to reconstruct gross earnings for this group, but this inevitably introduces measurement error problems.

Table 1 presents mean wages by marital status (as recorded at each date of interview) for the pooled sample over the eleven year period. This indicates that currently married men enjoyed the highest wages, at £10.75 per hour, followed by men who were divorced, separated or widowed at £9.83 per hour. Cohabiting men had average wages of £8.97 per hour, and single men who had never been married had the lowest average wages, of £7.37 per hour. Therefore the raw descriptive statistics confirm the presence of a wage premium for married men in Britain of about 46% relative to the single never married, and 23% relative to the currently not married. Cohabiting men earn 22% more than single never married men, but 17% less than married men. However, these mean wages do not control for differences in other observable characteristics (for example, married men are typically older than unmarried ones) nor in unobservable traits.

Econometric and empirical specification

Wages are assumed to be determined by the following equation:

$$\ln(w_{it}) = X_{it}\beta + M_{it}\gamma + \alpha_i + \varepsilon_{it} \qquad [1]$$

where w_{it} is the wage of individual *i* in year *t*, *X* is a vector of observable individual, household, job and employer related characteristics that determine wages, *M* is the variable capturing the marital status of the individual, α_i captures the unobserved, time-invariant characteristics of the individual, and ε_{it} is random error. Estimating this equation by OLS implicitly assumes that α_i is zero, and therefore uncorrelated with both w_{it} and *X*. However this is unrealistic in the present context, as *X* includes measures of education and job tenure that are correlated with, for example, any unobserved ability captured in α_i. Furthermore, if this unobserved individual specific effect is also correlated with the probability of being married, then the main coefficient of interest, γ, will be biased. In particular, the selection of men with unobserved wage-enhancing characteristics into marriage implies a correlation between *M* and α_i, and results in an upwardly biased estimate of γ. Panel data allow us to overcome these potential problems of endogeneity in two ways. The first is to estimate [1] using 'within-group' fixed-effects, which is equivalent to the simple OLS estimation in which the variables are defined as deviations from their individual means over the panel period. Therefore the model to be estimated becomes:

$$\ln(w_{it}) - \ln(\overline{w}_i) = (X_{it} - \overline{X}_i)\beta + (M_{it} - \overline{M}_i)\gamma + v_{it} \quad [2]$$

This removes the individual fixed-effect α_i and has been the standard approach in previous investigations of the marriage wage premium that use longitudinal data from the US (Korenmen and Neumark 1991; Cornwell and Rupert 1995; Jacobsen and Rayack 1996). Although clearly preferred to the OLS estimator, this procedure does not correct for bias due to unobservable characteristics that are correlated with marital status but that vary over time.

An alternative approach is to treat the unobserved effect α_i as random, and estimate [1] using random effects. The limitation of this approach is that it assumes that the unobserved individual specific effect, α_i, is independent of the observed characteristics in *X* and *M*. This is particularly problematical in our context, as we expect more able and motivated men to be both more likely to be married and to earn higher wages. Therefore the estimated coefficient γ will remain upwardly biased. To avoid this problem, we relax the assumption that α_i is independent of the time varying characteristics in *X* and *M*. Following Chamberlain (1984) we model the dependence between α_i and the observable characteristics by assuming that the regression function of α_i is linear in the means of all the time varying covariates. This can be written:

$$\alpha_i = \partial_0 + \overline{X}_i\partial_1 + \overline{M}_i\partial_2 + \eta_i \quad [3]$$

Where $\overline{X}_i$ and $\overline{M}_i$ refer to the vector of means of the time varying covariates for individual *i* over time. Equation [1] therefore becomes:

$$\ln(w_{it}) = X_{it}\beta + M_{it}\gamma + \overline{X}_i\partial_1 + \overline{M}_i\partial_2 + \eta_i + \omega_{it} \quad [4]$$

This is equivalent to the random effects regression with additional regressors $\overline{X}_i$ and $\overline{M}_i$. These panel data estimation procedures overcome some of the problems associated with self-selection and endogeneity that might otherwise result in a spurious positive coefficient on the married variable and the misleading conclusion that a marriage wage premium exists.

Another source of selection bias arises if selection into marriage depends on wage growth. In this case, changes in wages and marital status are interdependent and the estimated coefficient

on the married variable will be biased upwards if high wage growth increases the probability of marriage (Ginther and Zavodny 2001). The standard approach to address this kind of endogeneity is instrumental variables estimation. This requires at least one variable that is correlated with marital status but uncorrelated with the error term in the wage equation. We present and discuss the results from all three estimation procedures below.

Our basic empirical specifications include a wide range of individual, household, job and employer related characteristics that have previously been shown in the literature to determine wages. All specifications include, for example, variables to capture whether the man is an immigrant, registered disabled, has a limiting health condition, region of residence, age and age squared, highest educational qualification, recent employment history, industry, sector of employment, establishment size, weekly hours worked, number of paid overtime hours, trade union coverage and membership, place of work, elapsed job tenure, occupation and year indicators. We also include a range of variables that may identify non-pecuniary compensation such as the opportunity for regular promotion, regular pay increments, bonus payments or profit sharing, and contributing to an occupational pension scheme. In addition we estimate a number of different empirical specifications in order to test the various potential hypotheses explaining the presence of the marriage wage premium.

Hypothesis testing

Specialisation

The first hypothesis we consider is specialisation. This hypothesis derives directly from Becker (1991), in that marriage allows the husband and wife to specialise in either market or domestic production. Traditionally, the husband supplies his labour to the market and this household division of labour allows him to allocate greater effort to this. His productivity and his wage increase as a result. This hypothesis has a number of implications that can be directly tested with our data. In particular, if the marriage wage premium is due to specialisation then:

1. Men in cohabiting unions should exhibit a similar premium. We expect the same specialisation to occur irrespective of whether the couple are married or cohabiting, although given the less stable nature of cohabitation we might expect greater specialisation in marriage. The BHPS data allow us to identify whether a man is cohabiting at each date

of interview, and a positive coefficient on this variable (relative to the single never-married) would support the specialisation hypothesis.

2. Any wage gains from marriage should disappear when a marriage dissolves, as any benefits of specialisation will be lost (Davies and Peronaci 1997). Therefore divorced, separated or widowed men (who are not cohabiting) should not enjoy any wage premium. Again, the BHPS data allow us to identify such men, and a non-positive coefficient on this variable (relative to the single never-married) would support the specialisation hypothesis.
3. The wage premium should decline with the wife's working hours (Loh 1996; Davies and Peronaci 1997). This is because the degree of specialisation in the household declines as the hours worked by the wife increases. We can explicitly test this by including wife's weekly working hours as an additional explanatory variable in the wage regressions, and a negative coefficient on this variable would support the specialisation hypothesis.
4. The wage premium should increase with the number of domestic chores for which the wife is responsible. The degree of specialisation is higher in households where the wife is responsible for a larger proportion of domestic work, such as buying the groceries, cooking, cleaning and washing and ironing, and this should be reflected in the size of the marriage premium for the husband. BHPS data contain information on which partner in couple households is mainly responsible for a range of domestic chores, allowing us to test for this explicitly. In particular married and cohabiting men and women were asked:

> "Could you please say who mostly does these household jobs here? Is it mostly yourself, mostly your spouse/partner, or is the work shared equally? (1) Grocery shopping; (2) Cooking; (3) Washing and ironing; (4) Cleaning/hoovering."

For each married or cohabiting man, we have added together the number of chores for which the spouse/partner is mostly responsible (taking a value between 0 and 4) and use this as a direct measure of the degree of specialisation in the household.[6] A positive coefficient on this variable would support the specialisation hypothesis.

Human capital accumulation

[6] This takes the value 0 if the man is not married or cohabiting. This variable was not collected at 1992 and 1993, and hence the sample sizes are smaller in this specification. We have also experimented with including the number of chores for which the man is mostly responsible. This was statistically insignificant in all specifications.

The second, and related, hypothesis to explain the marriage wage premium among men is human capital accumulation. There are a number of different ways in which a wife can contribute to her husband's human capital. Traditionally, by fulfilling domestic chores and supplying a flow of services, she allows the husband more time to develop his work-related skills and knowledge and to build better social relations and networks that pay off in terms of promotions and faster wage growth. She may also provide funding for training, or provide more direct market-related information on job vacancies etc. Again, this human capital argument has a number of implications that can be tested directly using BHPS data. In particular, if the marriage wage premium is due to human capital accumulation then:

1. As with the specialisation hypothesis, cohabiting as well as married men should enjoy a wage premium.
2. The size of the premium should be lower if the wife also works, for reasons akin to those in the specialisation hypothesis.
3. We would expect the wage premium to increase with the elapsed duration of the marriage. The more time the husband has been married, the more time he has had to improve his human capital. Therefore a positive coefficient on the elapsed duration of marriage variable would support the human capital hypothesis.[7]
4. Unlike under the specialisation hypothesis, the premium should be retained to some extent on marital dissolution (Davies and Peronaci 1997). This is because although no longer married, the man has accumulated human capital while married and this should still be reflected in his wage. Therefore a positive coefficient on a variable indicating whether the man is divorced, separated or widowed (relative to the single never-married) would support the human capital hypothesis.
5. The presence of children in the household reduces the time available to the wife to augment her husband's human capital, and thus should lower the wage premium (Davies and Peronaci, 1997). Therefore a negative coefficient on the number of children in the household would support the human capital hypothesis.

Employer discrimination

[7] Information on marriage duration in the BHPS was originally collected in a marital and fertility history in 1992. To avoid dropping men who were not interviewed in 1992, we have constructed a missing marriage

The third explanation used to explain the wage premium for married men concerns employer discrimination in favour of married men. There are two potential reasons for this discrimination. The first is that employers favour married men as they conform to social expectations, although there may not be any actual productivity differences.[8] If this employer paternalism is the cause of the marriage wage premium then:

1. We would expect men with children to enjoy a larger premium than those without children as the presence of children reinforces the social expectation of the marriage institution. Therefore a positive coefficient on the number of children indicator would support the employer discrimination hypothesis.
2. According to this hypothesis, it is the state of being married rather than the duration of the marriage that is important, and therefore there should be no relationship between elapsed duration of the marriage and the wage received.

The second reason for employer discrimination in favour of married men is that employers might use marriage as a signal of particular, highly valued unobserved characteristics that are productivity enhancing, such as commitment, motivation, honesty etc. If this signalling is the cause of the marriage wage premium, then the marriage wage premium should disappear in models that allow for time invariant individual specific effects.

In the next section we present and discuss the results from various model specifications that explicitly test these hypotheses.

Results

Table 2, 3 and 4 present the results from our regressions, with the natural log of hourly wages as the explanatory variable and marital status and related variables among the explanatory variables. Each column shows the results from a different specification, testing the various hypotheses described above. In particular, specification [1] shows the results when marital

duration indicator which has been included in all relevant specifications. There are 2015 person-year observations with missing marriage duration (12% of the sample).

[8] A further implication of the employer favouritism hypothesis that we do not test here is that the marriage wage premium should not be detected for the self-employed (Loh 1996). As an experiment, and despite our reservations listed previously, we have estimated models using a sample including self-employed workers. Despite trying various different model specifications, we did not find any marriage premium for self-employed men. This can be interpreted as evidence in support of the hypothesis that employers favour married men.

status is measured by including a variable indicating whether or not the man is married. Specifications [2] and [3] introduce additional variables indicating whether the man is cohabiting, and whether he is divorced, separated or widowed. Specification [4] adds a variable measuring the weekly hours of work of the spouse (which takes the value zero if the man is not married or cohabiting)[9], while specification [5] adds the elapsed duration of the marriage (measured in years).[10] Specification [6] introduces a variable that measures the number of children in the family, while the final specification, specification [7], introduces the variable that measures the number of domestic chores for which the spouse is mainly responsible.

OLS

For the time being, we ignore issues surrounding potential selection effects and endogeneity, and estimate models using OLS. Focusing initially on the coefficients on the 'married' variable, our results are consistent with previous studies using British data. We find a positive and significant effect of marriage on wages, resulting in a wage premium of between 9% and 18%. These estimated premia are much lower than those observed in the raw data, indicating selection into marriage based on observable characteristics – married men have observable characteristics that are also associated with higher wages. The results indicate that cohabiting men also enjoy a wage premium relative to men who have never married, of between 5% and 9%. Men in partnerships enjoy higher wages, irrespective of whether or not they are legally married, evidence in favour of the specialisation and human capital arguments. We also find that the size of the premium enjoyed by married men falls with the number of hours worked by the wife, which again supports the specialisation and human capital explanations. Although the size of the coefficient is relatively small, it is negative and well determined, indicating that each hour worked by the wife reduces the wage premium of the husband by 0.16% (specification [4]). This suggests that a married man whose wife works a 40 hour week will enjoy a wage premium of 11% relative to a single never married man, compared to a premium of 18% for a married man whose wife does not work.

[9] We have experimented with including the square of the number of hours worked by the spouse, and also with including separate variables indicating that the spouse is in full-time and part-time employment. The results from doing so are qualitatively unchanged from those presented and discussed here.

[10] This takes the value 0 if the man is single. We have experimented with including the square of marriage duration, and also the log of marriage duration. The results from doing so were no different from those presented here.

The results in Table 2 also indicate that men whose marriage has dissolved enjoy a premium (of 8%) over men who have never married. This supports the human capital accumulation hypothesis over the specialisation hypothesis in that men retain the human capital benefits of marriage even after marital dissolution. We find no evidence of a statistically significant relationship between wages and elapsed duration of the marriage, evidence contrary to the human capital accumulation argument and in favour of the employer favouritism hypothesis. We also find a positive and statistically significant association between the number of children and wages, which is also contrary to the human capital accumulation argument and in favour of employer favouritism. The final specification includes the number of chores for which the spouse is mostly responsible, and the coefficient on this variable is positive and statistically significant. The size of the coefficient indicates that a married man whose wife is mostly responsible for all four domestic chores listed enjoys a wage premium of almost 17% relative to a single never married man, and of almost 8% relative to a married man whose wife is responsible for none of the chores. These OLS results therefore suggest that observable characteristics, household specialisation, human capital accumulation and employer discrimination explain a large proportion of the marriage wage premium observed in the raw data, but even so an unexplained premium of about 9% remains.

Fixed effects

Table 3 presents the estimates from the within-group fixed effects models.[11] These estimates indicate that, when allowing for time invariant unobserved characteristics, the size of the marriage premium falls dramatically to between 1% and 4%. This suggests that a large proportion of the premium observed in the OLS estimates is due to unobserved characteristics that are positively correlated with both marriage and wages, consistent with the selection and signalling arguments. However, in five of the seven specifications marriage still has a positive impact on wages that at least borders on statistical significance, and that can be attributed to productivity effects. Of the other variables of interest in these specifications, only the wife's weekly hours of work remain statistically significant. Each additional hour worked by the wife reduces the wage premium by 0.08%, suggesting that a married man whose wife works a 40 hour week enjoys no wage premium relative to a single never married man, compared to a

[11] There were 338 marriage formations and 105 marriage dissolutions within our sample over the period.

premium of 3% for a married man whose wife does not work (calculated on the basis of specification [6]). The fact that cohabitation has no effect on wages is evidence against both the specialisation and human capital accumulation hypotheses. The loss of the premium on marital dissolution is evidence against the human capital accumulation hypothesis in favour of specialisation. The negative impact of wife's working hours supports both the human capital accumulation and specialisation hypotheses, while the insignificance of marriage duration supports employer discrimination over human capital accumulation.

In specification [7], where the direct measures of the degree of household specialisation are entered, the marriage premium disappears – the coefficient, although positive, is no longer statistically significant. However, the coefficient on the household specialisation variable is positive and statistically significant, indicating that each additional domestic chore carried out by the spouse increases the man's wages by 0.8%. A married man whose wife is responsible for all four domestic chores receives a wage premium of 3.2% relative to a single never married man, although this premium is lost if the wife also works 40 hours per week in the labour market. These results suggest that a large proportion of the marriage premium observed in cross-sectional analysis is due to unobserved characteristics correlated with both marriage and wages. Any remaining premium, attributable to higher productivity, can be explained by specialisation within the household.

Random effects

Table 4 presents the estimates from the random effects specifications. These estimates show that marriage is associated with a wage premium of between 2.5% (specification [1] and [7]) and 5.8% (specification [4]), which lie between the OLS and the fixed effects estimates. Cohabiting men enjoy a wage premium over single never married men of about 2% (which borders on statistical significance) while each additional hour worked by the wife reduces the premium by 0.08%. Marriage duration, the number of children and previously being married have no effect on wages. As in the fixed effects specifications, the marriage premium is no longer statistically significant once the number of household chores for which the spouse is responsible is entered (specification [7]), while each chore carried out by the spouse increases the man's wages by 0.8%. Again, these results favour the signalling and specialisation hypotheses over the human capital accumulation hypothesis.

Alternative specifications

The results discussed this far potentially suffer from two further problems. The first is that if selection into marriage depends on wage growth, then *changes* in wages and marital status will be interdependent (men with high wage growth are more likely to be married) and the coefficient on the marriage indicator will be biased upwards (Ginther and Zavodny 2001). The second is the potential endogeneity of the wife's hours of work and number of domestic chores – it is possible that women who marry highly paid men do not need to work in the labour market and can devote more of their time to domestic chores, while those who marry men with lower wages are required to work to maintain a reasonable standard of living and therefore have less time to devote to domestic chores. We estimate several alternative specifications to deal with these potential sources of bias.

We first allow for selection on high wage growth by using a difference-in-difference type approach to examine whether men who marry over the observation period exhibit greater wage growth prior to marriage than other non-married men. In particular we estimate the following equation:

$$\ln(w_{it+1}) - \ln(w_{it}) = (X_{it+1} - X_{it})\beta + \gamma M_i^* + (\mu_{it+1} - \mu_{it}) \quad [5]$$

where w_{it} is the hourly wage, X_{it} is a vector of explanatory variables and μ_{it} is the error term. M_i^* takes the value 1 if the man married over the sample period, and zero if he remained single. The sample is restricted to working-aged men who were single at *t*, and therefore our control group comprises single men who did not marry over the sample period.[12] A positive value for the γ parameter would indicate that men who married over the period had higher wage growth pre-marriage than otherwise similar single men who did not marry. However, the estimated coefficient is -0.0070 (with a t-statistic of 0.98), indicating that men who married over the period did not exhibit higher pre-marriage wage growth than otherwise similar non-married men and therefore that selection into marriage is independent of wage growth.

[12] This results in an estimating sample of 1279 men contributing 4194 person-year observations. We do not present the full results from this estimation, but they are available from the authors on request. We have also estimated this model restricted the sample to men aged under 40, and the results are similar to those presented here.

The second way we allow for selection on high wage growth is through instrumental variables (IV). We use a man's responses to a set of attitudinal questions as instruments for being married – they are assumed to influence the probability of being married but not wages conditional on marriage. Individuals are asked the extent to which they personally agree or disagree with the following statements:

- A preschool child is likely to suffer if his/her mother works;
- All in all, family life suffers when the woman has a full-time job;
- A woman and her family would all be happier if she goes out to work;
- Both the husband and wife should contribute to the household income;
- Having a full-time job is the best way for a woman to be an individual person;
- A husband's job is to earn money; a wife's job is to look after the home and family;
- Children need a father to be as closely involved in their upbringing as the mother;
- Employers should make special arrangements to help mothers combine jobs and childcare;
- A single parent can bring up children as well as a couple.

We create 9 binary variables that take the value 1 if a man agrees or strongly agrees with the statement in question, and zero otherwise, and use these as instruments for being married.[13] We interpret a man's responses to these questions as signals of his attractiveness in the marriage market. Following Bound et al (1995) and Staiger and Stock (1997), we check for the validity of the instruments in two ways. Firstly, any potential instruments should significantly improve the first-stage model determining the endogenous variable (in our case the probability of being married). The results from likelihood ratio tests indicate that the inclusion of these attitudinal variables leads to a significant improvement in the explanatory power of the marriage probit at the 0.1% level of significance ($\chi^2(9)=283.7$). The second indicator suggested by Bound et al (1995) is the increase in the adjusted R^2. The model explains almost 2% more of the total variation when the instruments are added to the marriage probit.[14]

The estimates presented in the first panel of Table 5 result from pooled OLS, pooled IV, fixed effects IV and random effects IV respectively. The estimated coefficients on the married variable in the IV specifications are large, positive and (with the exception of the fixed effects

[13] Note that the sample sizes are lower in these IV estimates. This is because of missing information in men's responses to the attitude questions.

[14] As our first-stage equation is a probit model, the R^2s refer to pseudo-R^2s. The validity of these variables as instruments for marriage is reinforced by the fact that they prove to be both independently and jointly insignificant when entered into a wage equation.

specification) statistically significant. It appears that selection based on wage growth did not bias our previous estimates.

The estimates in the next panel of Table 5 deal with the potential endogeneity of the wife's working hours. We do this by creating 9 binary variables based on the wife's responses to the family attitude questions discussed previously and using these and also her age as instruments for her working hours. This necessitates focusing on married men only, and we present OLS estimates of wife's working hours on married men's wages as a comparison. Again, these attitudinal questions prove to be valid instruments. A test for their joint significance in the first-stage hours equation yields an F-statistic of 33.1, which is much higher than the values of 1 and 5 that Bound et al (1995) and Staiger and Stock (1997) suggest could signal weak instruments. They generate a partial R^2 of 0.02, which is ten times greater than the first-stage partial R^2 which generated concern for Bound et al (1995). The IV estimates are more negative than those in the OLS specification, and are statistically significant, indicating that the potential endogeneity of the wife's work hours did not bias our earlier results.

The final panel in Table 5 deals with the potential endogeneity of the number of domestic chores for which the wife is mostly responsible. Again we use the wife's responses to the family attitude questions discussed previously and her age as instruments, which again necessitates focusing on married men only, and we present the comparable OLS estimates. The responses to the attitudinal questions prove to be valid instruments – the results from likelihood ratio tests indicate that the inclusion of the instruments leads to a significant improvement at the 0.1% level of significance ($\chi^2(11)=136.5$) in the explanatory power of the ordered probit modelling the number of chores for which the wife is mainly responsible. This ordered probit model explains 1.3% more of the total variation when the instruments are added.[15] The IV estimates remain positive and statistically significant, indicating that the potential endogeneity of the number of chores for which the wife is mainly responsible did not bias our earlier results.

Conclusions

[15] In this case, our first-stage equation is an ordered probit model, and the R^2s refer to pseudo-R^2s.

In this paper we provide new and unique evidence on the relationship between marriage and wages among men in Britain. Cross-sectional analysis yields a wage premium for married men of about 15%, consistent with much of the previous literature. Using panel data and panel data methods, we find that this premium falls dramatically, indicating that about three-quarters of the observed premium in cross-sectional analysis is caused by unobserved individual heterogeneity and/or selection effects. Married men have unobserved characteristics that are also correlated with wages. The proportion of the premium explained by unobserved individual factors is similar to that found in the US literature. Korenman and Neumark (1991) find less than half of the premium is accounted for by unobserved individual specific effects, while Cornwell and Rupert (1995) find that the estimated returns to marriage are virtually zero once such effects are allowed for. Our results are consistent with the hypothesis that employers use marriage as a signal – a large proportion of the marriage premium is due to unobservable characteristics that are valued both by wives and by employers, such as motivation, loyalty, dependability and determination. Further research focussing on linked worker-firm data may shed more light on this issue.

Nevertheless, a relatively small but statistically significant marriage premium remains even when allowing for a wide range of individual, household, job and employer-related characteristics and time invariant individual specific unobservable effects. Our preferred panel estimates indicate the size of this premium increases with the number of domestic chores for which the spouse is mostly responsible, and falls with the wife's working hours. The relative sizes of the coefficients suggest that a married man whose wife does not work but whose wife is mostly responsible for four domestic chores enjoys a wage premium of about 4% relative to a single never married man. However this premium almost disappears if the wife also works 40 hours per week in the labour market. We show that the effects of the hours worked and domestic chores carried out by the wife are genuine, and not due to the potential endogeneity of the wife's decision to work. Our estimates therefore provide some evidence in favour of the specialisation explanation for the enhanced productivity of married men.

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Table 1: Average hourly wages by marital status for men

Marital status	Mean wage	Standard deviation	N person-years
Single never married	7.53	4.80	3355
Married	10.80	6.94	10303
Cohabiting	9.04	6.36	2368
Divorced/separated/widowed	9.90	5.94	829
Total	9.85	6.57	16857

BHPS 1991-2001. Hourly wages deflated to January 2002 prices.

Table 2: Estimated marriage wage premium for men in Britain: OLS

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Married	0.0917	0.1212	0.1433	0.1776	0.1611	0.1303	0.0912
	[7.67]	[8.60]	[8.99]	[9.58]	[7.09]	[5.36]	[3.40]
Cohabiting		0.0733	0.0904	0.0906	0.0908	0.0844	0.0511
		[5.12]	[5.86]	[5.88]	[5.90]	[5.45]	[2.92]
Divorced/separated/widowed			0.0745	0.0758	0.0798	0.0784	0.0798
			[2.74]	[2.79]	[2.90]	[2.86]	[2.74]
Wife's weekly hours of work				-0.0016	-0.0016	-0.0012	-0.0011
				[4.13]	[4.11]	[3.06]	[2.59]
Elapsed duration of marriage					0.0012	0.0015	0.0006
(years)					[1.16]	[1.45]	[0.58]
Number of children						0.0177	0.0135
						[2.92]	[2.11]
Number of wife's domestic chores							0.0189
							[4.72]
R squared	0.5953	0.5968	0.5975	0.5987	0.5988	0.5994	0.6019
N observations	16857	16857	16857	16857	16857	16857	13769
N individuals	3656	3656	3656	3656	3656	3656	3479

Notes: Absolute ratio of coefficient to standard error in brackets. BHPS 1991-2001. Dependent variable is log hourly wages deflated to January 2002 prices. Specifications also include immigrant, registered disabled, whether man has health condition that limits the type/amount of work possible, 9 industry indicators, 5 sector of employment indicators (central government, local government, health/education sector, nationalised industry, non-profit making organisation), 8 establishment size indicators, weekly hours worked, trade union coverage, pension scheme membership, 4 place of work indicators (work from home, place of work varies, travelling around, other place of work), weekly paid overtime hours, 7 regional indicators, age, age squared, highest educational qualification, elapsed job tenure, 3 occupation indicators, whether opportunities for promotion, whether receive bonus or profit sharing, whether receive annual increments, weeks spent in employment in last year, whether experienced unemployment in last year, whether experienced economic inactivity in last year, year indicators.

Table 3: Estimated marriage wage premium for men in Britain: Within-group fixed effects

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Married	0.0189	0.0286	0.0161	0.0367	0.0304	0.0306	0.0111
	[2.22]	[2.78]	[1.22]	[2.55]	[1.81]	[1.78]	[0.55]
Cohabiting		0.0167	0.0077	0.0077	0.0080	0.0080	-0.0073
		[1.69]	[0.66]	[0.66]	[0.68]	[0.69]	[0.52]
Divorced/separated/widowed			-0.0280	-0.0239	-0.0240	-0.0241	-0.0374
			[1.50]	[1.28]	[1.22]	[1.22]	[1.69]
Wife's weekly hours of work				-0.0008	-0.0008	-0.0008	-0.0007
				[3.61]	[3.58]	[3.47]	[2.67]
Elapsed duration of marriage					0.0003	0.0003	-0.0002
(years)					[0.34]	[0.34]	[0.18]
Number of children						-0.0003	-0.0007
						[0.07]	[0.14]
Number of wife's domestic chores							0.0081
							[3.09]
R squared	0.3110	0.3103	0.3036	0.3112	0.3127	0.3128	0.4350
N observations	16857	16857	16857	16857	16857	16857	13769
N individuals	3656	3656	3656	3656	3656	3656	3479

Notes: Absolute ratio of coefficient to standard error in brackets. BHPS 1991-2001. Dependent variable is log hourly wages deflated to January 2002 prices. Specifications also include immigrant, registered disabled, whether man has health condition that limits the type/amount of work possible, 9 industry indicators, 5 sector of employment indicators (central government, local government, health/education sector, nationalised industry, non-profit making organisation), 8 establishment size indicators, weekly hours worked, trade union coverage, pension scheme membership, 4 place of work indicators (work from home, place of work varies, travelling around, other place of work), weekly paid overtime hours, 7 regional indicators, age, age squared, highest educational qualification, elapsed job tenure, 3 occupation indicators, whether opportunities for promotion, whether receive bonus or profit sharing, whether receive annual increments, weeks spent in employment in last year, whether experienced unemployment in last year, whether experienced economic inactivity in last year, year indicators.

Table 4: Estimated marriage wage premium for men in Britain: Random effects

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Married	0.0258	0.0392	0.0359	0.0583	0.0449	0.0419	0.0253
	[3.05]	[3.85]	[2.76]	[4.11]	[2.69]	[2.45]	[1.26]
Cohabiting		0.0223	0.0198	0.02158	0.0218	0.0211	0.0082
		[2.25]	[1.72]	[1.88]	[1.89]	[1.82]	[0.59]
Divorced/separated/widowed			-0.0079	-0.0015	-0.0005	0.0006	-0.0057
			[0.43]	[0.08]	[0.03]	[0.03]	[0.26]
Wife's weekly hours of work				-0.0008	-0.0008	-0.0008	-0.0007
				[3.69]	[3.62]	[3.25]	[2.48]
Elapsed duration of marriage					0.0010	0.0010	0.0007
(years)					[1.01]	[1.00]	[0.65]
Number of children						0.0039	0.0039
						[0.93]	[0.82]
Number of wife's domestic chores							0.0083
							[3.18]
R squared	0.6137	0.6147	0.6147	0.6167	0.6166	0.6169	0.6208
N observations	16857	16857	16857	16857	16857	16857	13769
N individuals	3656	3656	3656	3656	3656	3656	3479

Notes: Absolute ratio of coefficient to standard error in brackets. BHPS 1991-2001. Dependent variable is log hourly wages deflated to January 2002 prices. Specifications also include immigrant, registered disabled, whether man has health condition that limits the type/amount of work possible, 9 industry indicators, 5 sector of employment indicators (central government, local government, health/education sector, nationalised industry, non-profit making organisation), 8 establishment size indicators, weekly hours worked, trade union coverage, pension scheme membership, 4 place of work indicators (work from home, place of work varies, travelling around, other place of work), weekly paid overtime hours, 7 regional indicators, age, age squared, highest educational qualification, elapsed job tenure, 3 occupation indicators, whether opportunities for promotion, whether receive bonus or profit sharing, whether receive annual increments, weeks spent in employment in last year, whether experienced unemployment in last year, whether experienced economic inactivity in last year, year indicators, individual means of the time-varying covariates, see text for details.

Table 5: Alternative specifications

	All men			
	OLS	IV	Fixed effects IV	Random effects IV
Married	0.0896	0.3598	0.1543	0.2806
	[7.35]	[4.40]	[1.04]	[2.50]
R squared	0.5929	0.5483	0.3765	0.5820
N observations	16148	16148	16148	16148
N individuals	3339	3339	3339	3339
	Married men only			
	OLS	IV	Fixed effects IV	Random effects IV
Wife's weekly hours of work	-0.0016	-0.0037	-0.0021	-0.0029
	[4.31]	[4.55]	[2.83]	[4.90]
R squared	0.5722	0.5687	0.1872	0.6011
N observations	10182	10182	10182	10182
N individuals	2096	2096	2096	2096
	OLS	IV	Fixed effects IV	Random effects IV
Number of wife's domestic chores	0.0194	0.1010	0.0387	0.0563
	[4.26]	[7.63]	[2.54]	[4.24]
R squared	0.5784	0.5738	0.3006	0.6058
N observations	8207	8207	8207	8207
N individuals	2010	2010	2010	2010

Notes: Absolute ratio of coefficient to standard error in brackets. BHPS 1991-2001. Dependent variable is log hourly wages deflated to January 2002 prices. Specifications also include immigrant, registered disabled, whether man has health condition that limits the type/amount of work possible, 9 industry indicators, 5 sector of employment indicators (central government, local government, health/education sector, nationalised industry, non-profit making organisation), 8 establishment size indicators, weekly hours worked, trade union coverage, pension scheme membership, 4 place of work indicators (work from home, place of work varies, travelling around, other place of work), weekly paid overtime hours, 7 regional indicators, age, age squared, highest educational qualification, elapsed job tenure, 3 occupation indicators, whether opportunities for promotion, whether receive bonus or profit sharing, whether receive annual increments, weeks spent in employment in last year, whether experienced unemployment in last year, whether experienced economic inactivity in last year, year indicators. Random effects estimation in addition includes individual means of the time-varying covariates, see text for details. Man's family attitude questions used as instruments for Married. Wife's family attitude questions and age used as instruments for wife's working hours and number of wife's domestic chores.