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Explaining the Gender Division of Labour: The Role of the Gender Wage Gap

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September 2007

Working Paper No. 07/174

ISSN 1473-625X

The Leverhulme Trust

CMPO Working Paper Series No. 07/174

Explaining the Gender Division of Labour: The Role of the Gender Wage Gap

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Abstract

This paper draws on the economics literature on market labour supply and the sociology literature on domestic labour supply. Each literature has explored the factors underlying male specialisation in market work and female specialisation in domestic work, but has tended to focus on labour supply to one sector (market or domestic) in isolation from supply to the other. This paper uses data from the UK Time Use Survey 2000 on a matched sample of spouses to estimate household labour supplies to both sectors as a function of the spouses' earnings capacities. The estimation procedure is a simulated maximum likelihood technique that allows for unobserved household-level random effects. In order to allow for non-participation, we estimate an available market wage for both the employed and non-employed individuals in the sample by combining the time use data with wage data from the Labour Force Survey. We use the estimated parameters from the labour supply equations to conduct a decomposition of two measures of the degree of gender specialisation within the household – the average gender gaps in weekly hours of market and domestic work. Our method allows us to decompose these gaps into a component that can be explained by spousal differences in earnings capacity and a residual gender effect. Our results suggest that the roles played by spouses within the household are responsive to economic incentives, but that the way in which men and women respond to those incentives is highly asymmetric. We conclude that a gender-neutral model of family decision-making cannot capture important features of the processes by which family members allocate time to different uses.

Keywords: gender wage gap, household labour, time allocation, division of labour

JEL Classification: D13, J16, J22

Electronic version: **http://www.bris.ac.uk/Depts/CMPO/workingpapers/wp174.pdf**

Acknowledgements

I am grateful to Carol Propper, Simon Burgess, Frank Windmeijer and Marco Francesconi for their advice and helpful comments. Also, I would like to acknowledge the ESRC for financial support. This paper has benefited from presentation at the Population Association of America Annual Conference (LA, March 2006) and the University of Bristol CMPO Seminar (October 2006).

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CMPO is jointly funded by the Leverhulme Trust and the ESRC

1. Introduction

The gender division of labour, in which men tend to specialise more in paid work within the market, and women tend to specialise more in unpaid work within the home, is a feature common to modern Western society. Economic theory suggests that the price an individual can command in the labour market for an hour of their time plays a key role in determining the way in which they allocate their time between different uses. This is the case in models of individual utility maximization, in which the wage determines the optimal degree of substitution between purchased goods and services and domestically-produced output, and also in models that emphasise the gains to intra-household specialization and trade. However, it is not clear to what extent in practice gender wage differences explain the observed gender division of labour. The importance of social norms regarding gender stereotypes and innate biological differences in the capabilities of men and women may swamp the role of gender wage differences in the allocation of time.

The question of the role of wage rates is important because it gives an indication of how far trends towards gender equality in educational attainment (i.e. in market human capital) and in labour market opportunities (i.e. in the returns to that human capital) will result in a more equal division of labour. There are numerous reasons why female specialisation in unpaid domestic work may be the subject of concern in a gender equity sense. For example, domestic human capital may be of little value relative to market human capital outside a specific relationship, and so lead to less bargaining power within the relationship (via a lower external threat point) and poorer outcomes in the event of relationship breakdown.

This paper uses data from the UK 2000 Time Use Survey to explore the relationship between wage rates and the intra-household allocation of time in a matched sample of spouses. A key feature of the dataset is that both spouses in a household simultaneously completed time diaries, and hence the data are not subject to problems of retrospective recall or error in the reporting of one's spouse's time allocation. The study analyses gender differences in paid and unpaid work alongside one another, as both theory and intuition suggest that an individual's time allocation decisions are determined simultaneously. This contrasts with much work in the area, which tends to focus on gender gaps in one or other type of work in isolation.

Maximum likelihood estimation is used to produce estimated labour supply functions for husbands and wives, for time in both paid and unpaid work. These labour supply functions estimate coefficients on an individual's own wage (which captures the relative gain to an hour's market work versus an hour spent in non-market activities) and on their wage relative to their spouse (which captures incentives for intra-household specialisation and/or bargaining power). These estimates then form the basis for a Oaxaca-Blinder type decomposition of the mean gender differences in weekly hours in paid and unpaid work, which allow us to draw some conclusions as to the importance of gender wage differences for the division of labour in the UK.

The estimation procedure is designed to account for a number of econometric issues in the specification of household labour supply functions. Firstly, the decisions of individuals who do not participate in the labour market, and hence record zero hours of paid work, are accounted for via a tobit specification. Secondly, the procedure allows for the fact that unobservable factors are likely to lead to decisions on time allocation that are correlated within a household, both for a given individual and between spouses, and produces estimates of these correlations. Thirdly, the problem of missing wages for non-participants is tackled by using predicted wages. The coefficients for these predicting wage equations are estimated on a much larger dataset, but one that is drawn from the same underlying population as the time use sample, and hence are determined much more precisely than the time use sample would allow. Finally, the endogeneity of observed wages is accounted for by estimating a predicted gross full-time hourly wage for all the individuals in the sample. This corrects for the fact that observed net wages will be correlated with labour supply, both because of the non-linear nature of the tax system, and because many women with domestic responsibilities trade off lower wages in exchange for the flexibility of part-time hours. Our methodology also accounts for sample selection bias in the prediction of wage rates of non-full-time workers.

To briefly preview our results, we find evidence of substantial gender-specific effects in the allocation of time, but more so to domestic work than to market work. Higher-wage individuals spend more time in market work at the expense of both domestic production and leisure. This suggests that trends towards the equalization of male and female wages will

result in some decrease in gender specialization, but also a reduction in average female leisure times. In households with children, greater equality of wages between husbands and wives is associated with an increase in female market work and a reduction in female domestic work, but we find no evidence that men's time is divided more equally between the two sectors when wage rates are more equal. This implies that reductions in gender specialization come about largely because wife's earnings are used to purchase substitutes for wife's domestic production, rather than because husbands assume greater responsibility for domestic work. Gender-specific behaviours surrounding children account for a large fraction of the gender division of labour, but we find evidence of substantial gender effects that apply equally to all men and women regardless of fertility.

Section 2 provides background on the gender division of labour, both in an international context and within the UK, an outline of theoretical models that seek to explain gender differences in time use, and a brief survey of previous findings on the role of gender wage differences. Section 3 provides details of the datasets used in the analysis and the methodology used to predict wages. Section 4 outlines the methodologies used to decompose average gender differences in work times and to estimate the underlying parameters of the household labour supply functions. Section 5 gives our results, analysis of the sensitivity of our findings to different methodological assumptions, and sub-group analyses for households with and without children and for the sub-sample of two-earner couples. Section 6 summarises our findings and draws some conclusions.

2. Background

2.1 The gender division of labour in an international context

The tendency for men and women to specialise respectively in market and domestic work is a common feature of developed countries. Research into the determinants of the market and domestic labour supplies of individuals tends to focus on one type of work in isolation[1]. The nature of these research agendas obscures the fact that gender inequalities in total work times are far less marked than gender inequalities in labour supplied to each sector. The real differences in men's and women's experiences of work over a lifetime come not from decisions about how much to work in total (and hence how much leisure to enjoy), but from decisions about how to divide total labour supply between the market and domestic sectors.

To illustrate this, Figure 1 shows data on the gender differences in the mean weekly hours supplied to each sector for a sample of 12 developed countries. We define the 'market work gap' as the mean difference between men's and women's weekly market hours, and similarly the 'domestic work gap' as the mean difference between women's and men's weekly hours of domestic work[2]. The countries in Figure 1 are arranged from those in which men's total work time exceeds women's on the left, to those in which women work longer hours in total on the right (the magnitude of the gap in total work times is given by the difference between the black and white bars). Time use data are not fully comparable across countries and relate to populations of slightly different ages, so caution is needed in drawing conclusions from Figure 1. However, it is clear that substantial gender specialisation exists across the US, Western and Eastern Europe and Australia. And, with the exception of the Eastern European countries on the right of Figure 1, it is noticeable that the sizes of the market and domestic work gaps are far larger than the differences between them.

[1] See, for example, the economic literature on paid labour supply (e.g. Blundell and MaCurdy, 1999) and the sociological literature on the division of domestic labour (e.g. Shelton and John, 1996).

[2] Other measures of the degree of specialisation are possible, for example, the share of total hours supplied to each sector by men, or the ratio of male to female labour supply in each sector. As Bianchi et al. (2000) argue, the interpretation of changes in these kinds of ratio variable can be confused, as changes may affect the numerator, the denominator or both. We adopt the definition of the domestic work gap used by Bianchi et al., and define the market work gap analogously.

Also shown in Figure 1 is the gender pay gap (the ratio of average female gross earnings per hour to average male earnings per hour) for a sub-sample of countries. Not much can be inferred on the basis of such a small sample, plus the pay gap is likely to be endogenous with respect to time allocation decisions, but it is clear that gender differences in time use sit alongside substantial differences in wages. The question addressed in this paper is the extent to which these differences in labour market opportunities in the UK can account for the observed gender division of labour.

2.2 The gender division of labour in the UK

The implications of the sexual division of labour for the experiences of men and women in the UK manifest themselves along a wide range of dimensions. In terms of market production, women aged 16-64 are nearly twice as likely to be classed as economically inactive as men in the same age group. Even where women do work in the market, they contribute far fewer hours to paid work – female workers are four times as likely to work part-time as male workers[3]. With regard to non-market production, women without children contribute 70 percent more hours per week to domestic production than men, whilst the figure for women with children under 16 is more than double that of men[4]. Of children living with a single parent, over 90 percent live with the mother[5].

The assumption of differing responsibilities according to gender has implications for the levels of human capital individuals choose to acquire and the occupations they choose to pursue. To the extent that the returns to education and experience in the labour market are larger the more hours an individual works, women who anticipate specialising in domestic production have less incentive to accumulate such human capital. For example, among the working age population in the UK, 56 percent of men have the equivalent of an A-level or higher, compared with 43 percent of women[6]. Investments in non-market rather than market human capital will tend to predict the occupations chosen by women when they do choose to participate in the labour market. Women tend to cluster in occupations where the skills required are complementary to those required in domestic production, such as the provision

[3] EOC (2005a)
[4] EOC (2005b)
[5] ONS (2005)
[6] ONS (2003)

of emotional and caring services and household management. Women account for over 80 percent of workers in personal services and administrative and secretarial occupations, and for a similar proportion of those employed in the health, social work and education sectors[7].

All of these factors contribute to a substantial gender gap in pay. Olsen and Walby (2004) report a gender gap in average hourly earnings of 18% for those working full-time in 2003, and a huge 40% for those working part-time. They attribute over a third of the gender differential in pay to differences in life-time working patterns – the fact that women tend to have spent longer out of the labour force engaged in family care than men, and the fact that when they do work, they often work part- rather than full-time. Around a fifth of the pay gap is attributable to labour market factors such as the concentration of women in low-paying occupations and the fact that women are less likely to work in larger, unionised establishments. Differences in education between men and women account for less than 10% of the pay gap, leaving 38% that they attribute to discrimination (whether direct or indirect), systematic disadvantage and gender-specific preferences or motivations.

There is evidence, however, that long-term social trends may be leading to an erosion of the gender pay differential. The gender pay gap for full-time work has fallen from 29 percent in 1973 to around 17 percent in 2005 and female labour force participation rates have risen by around 10 percentage points over the same period. Rising divorce rates, increases in the age at first marriage and falling fertility have all increased the number of years that women can expect to spend as economically independent, i.e. without a spouse, and without responsibility for dependent children. Average age at marriage has increased by around 6 years for both men and women since 1975, the average age of mothers by 3 years and the total fertility rate has fallen from 2.37 in 1971 to 1.78 in 2004. Trends in the attainment of educational qualifications also point towards a reduction in the gender pay gap. In 1970/1 58 percent of students in further education and 67 percent of students in higher education were male. By the year 2000 these proportions had reversed, such that 59 and 57 percent of students respectively were female[8]. The analysis in this paper provides some indication of how we might expect rising female wages to impact on the gender division of labour. Of

[7] EOC (2005a)
[8] EOC (2005c)

course, long-term demographic trends may lead to changing social norms and have further consequences for the working patterns of men and women, but such analysis is beyond the scope of what is feasible using a cross-sectional time use dataset.

2.3 Welfare consequences of female specialisation in domestic work

When thinking in terms of individual welfare, the presumption is often that women whose main role is as a carer have access to a male partner's income. Yet there is much evidence that female specialisation in domestic work disadvantages women across a number of dimensions. Women are 14% more likely than men to live in households with equivalised incomes below the poverty line (calculated at 60% of median income). Female-headed households – lone parents and retired women living alone in particular – are especially at risk. There is evidence that women face substantial drops in income following separation or divorce, whereas men can expect to experience small increases in income[9]. Pensions which assume contributions over a full-time continuous working lifetime of 40 or more years discriminate implicitly against women and it is estimated that only 49 per cent of women pensioners receive the full Basic State Pension, compared with 92 per cent of men[10]. There is also evidence that women who don't participate in the labour market are at a higher risk of experiencing domestic violence,[11] perhaps because exit from an abusive relationship is hindered by economic dependence.

Finally, both theory and evidence from the intra-household bargaining literature suggest that specialisation in the domestic sector may have implications for an individual's well-being within a marriage, as well as in the event of relationship breakdown. As Brines (1994) notes, we can think of the household in which spouses specialise and trade with one another as a situation of bilateral monopoly. But as Brines goes on to point out, there is a fundamental asymmetry in the nature of what each partner has to trade: "Housework – unpaid labour performed within the household – is by definition without exchange value in the classic sense; that is, it is nonportable or illiquid as a form of currency beyond the specific relationship, unlike what the main breadwinner brings to the trade" (pp. 656). It follows that

[9] Brockel (2005)
[10] EOC (2003)
[11] Mirlees-Black (1999)

an individual who has acquired relationship-specific domestic human capital will have lower expected utility in the event of divorce than the partner who specialises in market work, both because they can expect lower earnings in the event that they must be self-supporting, and because of their lower desirability to potential re-marriage partners. The bargaining literature then suggests that the spouse with the stronger 'outside option' will have more influence over the allocation of resources in the household, for example by wielding the 'threat' of divorce over the partner with the weaker outside option (see Lundberg and Pollak, 1996, for a review of the literature). Folbre (2001) suggests a further reason why specialisation in the domestic sector may weaken an individual's bargaining power. For individuals who are engaged in caring labour, such as caring for children, threats to withhold their labour as an exercise of bargaining power may not be credible – the individual may become a 'prisoner of love' in the sense that their unwillingness to neglect the children allows exploitation by their spouse.

One empirical strand of the literature explores the extent to which the income controlled by the husband and wife impacts on family behaviour. Examples of the findings of this literature are that increases in the wife's income relative to the husband's income are associated with increases in expenditure on restaurant meals, childcare and women's clothing and reduced expenditure on alcohol and tobacco (e.g. Lundberg, Pollak and Wales, 1997, Phipps and Burton, 1992). Increases in child health, nutrition and survival probabilities have also been linked with mothers' control over resources (e.g. Hoddinott and Haddad, 1995). This suggests firstly that men and women have systematically differing preferences over the way in which household income should be allocated, and secondly that an individual's income contribution to the household plays a role in family bargaining, over and above its implications for external threat points. As Pollak (2005) suggests, spouses may maintain 'mental accounts' that relate each spouse's consumption to the income they contribute, which may then be reinforced by money management practices such as separate bank accounts.

2.4 The role of wages in the gender division of labour

It is clear that past decisions regarding labour supply and occupational choice will play an important role in gender wage differences that are observed in cross-sectional data on spouses. Wages are not assigned exogenously to individuals and it is not our aim in this paper to assess whether observed gender wage differences lead *causally* to the observed division of

labour. Such an investigation would require some exogenous variation in wages, or data with a panel aspect that could be used to relate changes in wages to changes in time allocation. Rather, our question is whether, given the earnings capacities of the two spouses in the labour market, individuals do in fact allocate time in the way economic theory would predict. If the allocation of time does appear sensitive to spousal wage differences then it is at least possible that changes in the gender distribution of wages would be accompanied by changes in the division of labour. If, however, other factors such as biological differences and social norms are relatively more important, then it is unlikely that the equalisation of pay between men and women would lead to a substantial erosion of gender specialisation.

Becker's (1991) pioneering work on the economics of the family suggests two reasons why gender wage differences between spouses might be associated with a traditional division of labour. The first relates the case where individuals act as autonomous, egoistic individuals and allocate time in order to maximise own (selfish) utility. Chapter 1 of 'A Treatise on the Family' outlines such a model and shows that when an individual participates in the labour market, the marginal utility of time from all uses must be equal to the wage rate in equilibrium. The wage effectively represents the 'price' of time spent in non-market uses in terms of foregone consumption. Increases in the wage will have an income and a substitution effect. The income effect reduces time spent in market work by raising the demand for non-market time, whilst the substitution effect increases time in market work because non-market time becomes relatively more expensive. Provided that the substitution effect dominates, higher-wage individuals will devote more time to market work than lower-wage individuals and hence spend less time in non-market uses, including domestic production. In practical terms, the individual utility function model captures the notion that, at higher wage rates, individuals may find it optimal to purchase market substitutes for domestic output (such as childcare or restaurant meals) with the earnings generated by additional market work. At lower wage rates the real price of such goods and services is higher and it is more cost effective to produce within the home.

It is possible that the earnings an individual could generate from even one hour of market work are insufficient to compensate for the accompanying reduction in non-market time. In this case the shadow price of time (or reservation wage) will exceed the available market

wage and the individual will not participate in the labour market at all. The substitution effect associated with higher wages provides one rationale for why men might devote more time to the market than women, and correspondingly less time to domestic production. However, if women are innately more productive than men in domestic work, or if they systematically prefer domestically-produced output to purchased goods and services, we would not expect men and women with a given wage rate to allocate time in the same way.

The second way in which the gender differential in spouses' wage rates might generate a division of labour is outlined in Chapter 2 of 'A Treatise on the Family'. Becker's key insight is that there are potential gains to intra-household specialisation and trade. If spouses differ in their relative market and domestic productivities, then household output will be maximised if individuals allocate time to the sector in which they are relatively most productive and trade surplus output with their spouse. Becker makes the analogy with a system of international trade, in which countries specialise on the basis of their comparative advantage. In terms of intra-household specialisation, an individual has a comparative advantage in market work if their relative wage (the ratio of their own to their spouse's wage) is greater than their relative domestic productivity (again, the ratio of own to spouse's productivity). The greater the differential in the spouses' relative productivities, the larger are the potential gains to the household of a division of labour. If men and women do not differ in domestic productivity then higher male wages will automatically lead to a male comparative advantage in market work. It is also the case under this assumption, however, that couples in which the wife has the higher earnings capacity should exhibit a non-traditional division of labour in which the wife specialises in the market and the husband in the domestic sector. Becker's theory is essentially gender-neutral and places key emphasis on the assumption of rational optimising behaviour on the part of individuals. The assumption that outcomes are efficient requires that spouses exploit any potential gains from intra-household trade. In Becker's model this follows axiomatically from the specification of a single household utility function (the so-called unitary assumption), a specification that has been much criticised for ignoring conflicting preferences between the individual members of the household. Browning and Chiappori (1998) argue that even when the unitary assumption is dropped, the household can be characterised as a repeated 'game' in which the preferences of the participants are known

to one another. These features, they argue, make it plausible that household members find mechanisms to support efficient outcomes.

The preceding discussion showed that under the assumption of equal domestic productivities, the higher-earning spouse has an incentive to specialise in market work. Becker provides two reasons, however, why it is likely that there will be systematic differences in domestic productivity between spouses. Firstly, he assumes that individuals have the opportunity to invest in different types of human capital that raise productivity differentially in the market and domestic sectors. If this is the case then the gains to a division of labour are raised if each spouse specialises in the type of human capital they choose to accumulate as well as in the allocation of time. This assumption implies that the unobserved characteristics of individuals will tend to exaggerate differences in time allocation that are associated with a given wage differential. Over time, specialisation in the domestic sector will lead to the acquisition of skills that reduce the degree of substitutability between spouses' time inputs into domestic work. At the same time, lack of on-the-job market human capital investment will reduce the potential market wage of the spouse specialising in domestic work. In terms of our analysis, the mechanism of specialised human capital investments implies that we should find a strong association between the spousal wage differential and the degree of specialisation within the household. Note, however, the assumption that domestic productivity depends strongly on human capital is essentially an assertion. In a technologically advanced society, it is possible that the bulk of domestic tasks are routine in nature and do not require high degrees of skill.

The second reason for supposing that domestic productivity differs systematically between spouses relates to the assumed biological superiority of females in domestic production. The role of women in childbirth and breastfeeding provides an unarguable example of tasks in which men's inputs into domestic production cannot substitute for women's inputs. Becker argues that complementarities exist between the bearing and rearing of children, for example because "a mother can more readily feed and watch her older children while she produces additional children than while she engages in most other activities" (pp. 38). If biology is an important factor in determining an individual's domestic productivity, then women may have a comparative advantage in domestic work that swamps the role of gender differences in wage rates. We would then expect to find little association between the spousal wage

differential and the allocation of time, because women's time is always relatively more productive than men's in the domestic sector.

Even when we allow for the role of biological differences between men and women, Becker's model is essentially gender-neutral in that it characterises individuals solely in terms of their relative market and domestic productivities. The requirement that individuals allocate resources rationally in order to produce efficient outcomes implies that the spouse with a comparative advantage in market work must specialise in the market sector, regardless of their gender. A critique of this gender-neutrality approach has arisen in the sociological literature on the division of housework between spouses. Bianchi et al. (2000) and Brines (1994) provide good summaries of the literature on this gender perspective. The argument is that the performance of certain tasks provides a way for individuals to enact their gender identity and fulfil the socially determined roles of wife and mother, or husband and father. Women enact their femininity by being economically dependent on a husband, performing housework and maintaining the standard of the home environment, whereas men enact their masculinity by being the main breadwinner and avoiding the performance of 'women's work' within the home. Socialisation from early childhood onwards and occupational, legal, political and policy structures shape both the preferences of, and opportunities available to, men and women in systematically different ways. In terms of a neoclassical model of utility maximisation, this can perhaps best be characterised by the assumption that the relative disutilities of time spent in market and domestic work differ substantially between men and women. In households in which the wife has a comparative advantage in market work, a non-traditional division of labour would be associated with a reduction in the utilities of the members of the household that could outweigh the gain in output resulting from an efficient allocation of time. In terms of our analysis, the greater the importance of the enactment of gender roles, the smaller the association we would expect to find between spouses' wage rates and the allocation of time.

2.5 Previous findings

As we have noted, much of existing literature on gender differences in work patterns focuses exclusively on either market work or domestic work in isolation. In addition, research on the

determinants of domestic work is carried out mainly within the disciplines of sociology and demography, whilst economists have studied the factors underlying market labour supply.

2.5.1 Domestic labour supply

A large body of empirical sociological literature has arisen on the division of housework between spouses. It is difficult, however, to disentangle the role played by gender differences in wage rates because the most commonly adopted specifications include control variables that confuse interpretation. Specifically, many authors have investigated the relationship between the share of household income contributed by each spouse and the amount of time each spends in housework. This variable conflates gender differences in an outcome of the intra-household allocation process – market labour supply – with gender differences in earnings capacities. The implicit assumption of many authors is that market work hours are determined exogenously with regard to domestic work hours. Indeed, this assumption appears to underlie the entire 'time availability perspective' in the sociological literature, which models domestic work as a function of the time remaining to an individual after market work and study commitments are taken into consideration[12].

Bianchi et al. (2000) and Hersch and Stratton (1994) both find that the wife's share of household income is negatively associated with wife's housework hours and positively associated with husband's hours. To see the problem of interpretation of this finding, note that even if the allocation of time to market work were entirely unrelated to the relative productivities of the spouses, this pattern would emerge if spouses who work longer in the market, and hence generate more income, also tend to work less in the domestic sector. The fact that the income share variables are significant even when controls for husbands' and wives' hours of market work are included does suggest that gender wage differences play some role in the allocation of time. But holding market hours constant removes the mechanism by which higher wages lead to a shift in time allocation from the domestic to the market sector. Rather, the interpretation of the income share variable must reflect only the partial impact of the gender wage differential on domestic work via its influence on

[12] See Shelton and John (1996) for a review of the sociological literature on domestic labour supply that outlines the time availability perspective.

bargaining power or differential spending on consumption goods versus substitutes for domestic output.

Brines (1994) finds that wives' housework hours fall as their relative contribution to household income rises, whilst the relationship between husbands' hours and their relative income contribution exhibits an inverse U-shape – households in which income is produced equally by the husband and the wife see greater male housework hours than households in which either the husband or the wife is the main breadwinner. The finding that men do less housework when the wife is the main breadwinner relates particularly to men in low-income households and the long-term unemployed. Brines interprets the finding as evidence of the 'gender display' perspective in which men who are economically dependent on their wives maintain their masculinity by resisting participation in the 'women's work' of housework. This study is subject to the problems of interpretation highlighted above, but we note that the finding that both spouses' housework time is reduced when the female is the main breadwinner is equally consistent with a model in which male and female earnings are spent differentially on substitutes for domestic production. Bittman et al. (2003) report similar findings to Brines in a specification that controls for market work hours.

Alvarez and Miles (2003) analyse data on the housework of a sample of Spanish two-earner couples and, in a similar spirit to this paper, perform a Oaxaca-Blinder-type decomposition of the gender difference in housework hours. Again, they use a spouse's contribution to household income as an explanatory variable and find that increases in the wife's share are associated with reductions in the wife's housework hours but with no significant changes in the husband's housework time. The results of their decomposition suggest that differences in the observable characteristics of spouses account for only a small fraction of the gender gap in housework times – gender-specific effects are overwhelmingly responsible for the unequal division of domestic labour.

2.5.2 Market labour supply

The empirical economics literature on family labour supply has not typically addressed the question of why males supply more market labour than females directly. Instead, empirical work has focussed on the testing of restrictions implied by theoretical models of individual

and collective rationality or, alternatively, the estimation of labour supply elasticities that can be used to assess the impact of tax and welfare policies. However, the results presented in many of these studies do provide evidence on the sensitivity of men's and women's labour supplies to own and spouse's wages. Evers et al. (2006) provide a meta-analysis of 239 estimates of the uncompensated wage elasticity of labour supply. They report a mean elasticity for men of 0.07 and for women of 0.41. There is much less variation in estimates of the elasticity for men than for women, and the median values are more similar at 0.08 and 0.28 respectively. Their findings do suggest, however, that market labour supply is responsive to the wage for both sexes, and more so for women than for men.

Studies that analyse the labour supply of married couples also provide evidence on intra-household influences on labour supply. Lundberg (1988) finds that, amongst couples without young children, neither the husband's nor the wife's labour supply is sensitive to the earnings or the market hours of the spouse. Lundberg characterises this finding as consistent with the complete independence of labour supply decisions, conditional on the composition and permanent characteristics of the household. Where young children are present, however, Lundberg finds evidence of labour supply interactions. Higher husband's earnings are associated with lower wife's market hours, although the reverse it not true for higher wife's earnings and husband's market hours. Fortin and Lacroix (1997) estimate labour market supply functions for two-earner households with at most one child. They find positive and significant own-wage elasticities but cross-wage elasticities that are small, imprecisely determined and rarely reach statistical significance. Devereux (2004) finds evidence of a significant negative association between the husband's wage and wife's labour supply but, again, no evidence of a symmetric relationship between the wife's wage and husband's labour supply.

3. Data

3.1 Time use data

Data on the market and domestic labour supplies of married/cohabiting couples[13] are taken from the UK 2000 Time Use Survey (UKTUS). We restrict our attention to traditional nuclear families, as they are households in which there exist potential gains to a gender division of labour. Social and biological norms regarding gender roles and the raising of children also focus strongly on the behaviour of heterosexual couples. To the extent that the majority of individuals anticipate forming such a union at some point in their lives, the behaviour of married couples provides a focal point that will influence human capital decisions and notions of what makes a 'desirable' marriage partner. We exclude households with any additional persons aged 16 or over in order to focus the analysis on the division of labour between two individuals of different sexes.

The UKTUS is a national household-based survey with questionnaire and time diary components. Each household member was asked to complete two 24-hour time diaries – one on a weekday and one on a Saturday or Sunday – identifying his or her primary and secondary time uses for each 10-minute interval. The data contain information on 6414 households in total although our working sample is restricted to couples in 1170 households. Appendix Table A1 details the sample selection criteria used to define the working sample.

Comparisons of the information derived from time diaries and that derived from survey questionnaires suggest that diary data is substantially more reliable. Juster and Stafford (1991) review evidence on this issue and argue that 'retrospective recall' methods result in systematic biases because many tasks are not memorable, not repetitive day by day and do not leave traces in terms of market measurements that may be used as a proxy. The major bias appear to be over-reporting, due to the fact that respondents recall a day on which the activity was particularly prominent and treat that as an average day. Attitudes and norms also influence the information provided in response to survey questions. Over-reporting is found

[13] Throughout we use the term 'married' to refer to both married and cohabiting couples. Kalenkoski et al. (2005) analyse data on market labour supply and childcare from the UKTUS and find no significant differences in the behaviour of married and cohabiting couples.

even for market labour supply, which is surprising, given the regularity of many people's work schedules. In contrast, the consecutive structure of a diary minimises the reporting burden on respondents by allowing them to record time use in its naturally occurring order and forcing them to account for all 24 hours in the day. An important feature of the UKTUS is that husbands and wives are each responsible for completing their own individual time diaries. Discrepancies in the self-report and spousal-report of an individual's time use may introduce biases into analysis that relies solely on information provided by one household member. For example, Alvarez and Miles (2003) find that wives are more likely to report that husbands' hours of housework are zero than are husbands themselves. This is also the finding of Kamo (2000), although neither study finds discrepancies in wives' housework hours depending on the identity of the respondent. In summary, the household-level structure and the time-diary element of the UKTUS enable us to avoid many of the reporting biases in hours of work that are associated with questionnaire-based surveys such as the British Household Panel Survey.

For the purposes of this study, market work is defined to include on-the-job breaks, activities relating to employment and job-seeking, commuting time and travel in the course of work. Domestic work covers all activities classed as household and family care, plus associated travel time (such as travel related to shopping and escorting a child)[14]. Primary time uses only are analysed in the main body of the paper, although the sensitivity of our results to the definitions of market and domestic work are explored in Section 5.4. Weekly hours of work are derived as the weighted sum of hours recorded in the weekday diary (with weight 5) and hours recorded in the weekend diary (with weight 2).

3.2 Wage data and variable selection

The aim of this paper is to explore the association between gender differences in wage rates and the gender division of labour. We argue that the appropriate wage to use in this case is the gross hourly wage rate that an individual could receive, were they to take a full-time job. The average net wage, usually computed as the ratio of usual weekly take-home pay to usual weekly hours of work, is inappropriate because it is determined jointly with market labour

[14] Specifically, market work is the sum of activities coded 1, 911, 913 and 914 in the UKTUS. Domestic work is the sum of activities coded 3, 923, 931, 936, 937, 938, and 939.

supply via the tax system. An individual who works only a few hours in the market will have a higher net wage per hour than an individual who works longer hours, even if both have the same gross wage, because of the non-linearity of marginal tax rates. The use of net wages would then tend to underestimate the true gender wage gap because men work longer hours than women and hence pay a greater fraction of their earnings in tax.

Our interest in this paper lies in the extent to which spouses' time allocation is influenced by the absolute and relative *earnings capacities* of the husband and wife. The theory of comparative advantage suggests that it is an individual's relative abilities in generating market income and in producing domestic output that will determine the sector in which they specialise and the degree of specialisation. Once an efficient division of labour is determined, the observed wage of the individual who specialises in the domestic sector may diverge from the wage he or she could receive, were he or she to instead specialise in the market sector. Becker's (1985) model of an individual's optimal allocation of energy between different activities provides a theoretical rationale for why women with domestic responsibilities will choose 'segregated' jobs and occupations, invest less in on-the-job human capital and earn less than individuals who do not shoulder the same domestic responsibilities. Hersch and Stratton (1997) estimate the direct effect of housework on wages using OLS, IV and fixed-effect techniques and conclude that gender differences in domestic responsibilities explain a substantial fraction of the gender gap in observed wages. In the UK, the impact of domestic work on wages manifests itself in particular in the 'part-time pay penalty'. Manning and Petrongolo (2005) provide evidence that around 45 percent of women in the UK in 2003 worked part-time and, on average, earned 22 percent less than women who worked full-time. When they account for differences in the composition of the samples of part-time and full-time women, they find a residual pay penalty to part-time work of between 3 and 10 percent, depending on whether one accounts for occupational differences between the two groups. There is evidence that we can think of this as a kind of compensating wage differential, in that women appear to be prepared to accept a lower wage in return for the greater flexibility afforded by a part-time job. Ninety percent of women working part-time (excluding full-time students) stated that they did not want a full-time job, with the vast majority citing domestic or family commitments as the primary reason.

The question we address in this paper is how far fundamental differences in the earnings capacities of spouses (which depend on levels of human capital and the return to that capital in the labour market) can account for the gender division of labour. In terms of our analysis, the existence of the part-time pay penalty introduces an endogeneity bias into estimates of the impact of the wage on time allocation. To see this, suppose that the full-time wage available to a wife is identical to that of her husband, but that she has an advantage in domestic work as a result of biological factors and social norms. She will specialise in the domestic sphere and may take a part-time job at a lower wage than would be available if she were instead to work full-time. A comparison of the observed wages of the husband and wife would suggest that she has assumed domestic responsibilities at least in part because her earnings capacity is lower, when in fact the causation runs in reverse from the division of labour to the wage. We tackle this problem by predicting an expected full-time wage for individuals who work part-time or not at all in the labour market. In order to maintain a consistent stochastic specification, we predict wages for the full sample of spouses, including those who do work full-time, and use these predicted wages as the explanatory variables in our analysis. In effect, we make the identifying assumption that the wages of individuals working in full-time jobs represent their true underlying earnings capacity, and that the trade-off of lower wages for greater flexibility operates solely through the decision to take a part-time job.

Because the number of full-time workers in our UKTUS working sample is relatively small – 941 men and 421 women out of the 1170 households – we estimate the coefficients of the wage equations using the Quarterly Labour Force Survey (QLFS). The larger sample sizes in the QLFS allow us to estimate the returns to various characteristics with much more precision than if we were to use the UKTUS sample[15]. Both the QLFS and UKTUS are produced by the Office of National Statistics and use sampling procedures designed to generate a nationally-representative random sample. A number of questions in the two surveys are phrased in identical ways and can be used to define a common set of explanatory variables. We take data for the months June 2000 to September 2001 inclusive to coincide with the survey dates of the UKTUS, and retain only observations on individuals in married/cohabiting couples aged between 18 and retirement age and not in full-time education for comparability. Use of the QLFS has the added advantage that it contains data

[15] Sample sizes used from the QLFS are 15 669 full-time working women and 29 187 full-time working men.

on gross hourly wages, whereas the UKTUS contains data only on average net wages, or more specifically on usual take-home pay after deductions and usual hours of work. This enables us to predict an individual gross hourly wage without the need for complicated calculations of the tax deducted from pay at source.

The simplest way to predict a full-time wage for the individuals in our sample is to run a Mincer-type wage equation on the QLFS sample of full-time workers (we run separate regressions for men and women) and then apply the estimated coefficients to the characteristics of the individuals in the UKTUS sample. Characteristics that are available in both datasets are: a detailed breakdown of highest educational qualifications into 40 discrete categories; age and age squared; ethnicity; month and year of survey; region of residence; number and age of children in the household; marital status; and 4 variables capturing health problems and the way in which they limit the individual's activity[16]. It is likely however, that such a method would over-estimate the potential wages of individuals who currently work either part-time or not at all in the labour market. This is partly because full-time workers are likely to have higher levels of market human capital resulting from more complete work histories and on-the-job experience (data on which are unavailable in the UKTUS) and partly because of self-selection into full-time work on the basis of unobservables. Hence both the constant term and the estimated returns to observed characteristics in the wage equation are likely to be biased upwards, relative to the true returns a part-time or non-worker could expect to receive.

The preferred specification used in this paper estimates separate wage equations for full-time workers and those who work part-time or not at all (and also for men and women)[17]. Hence we use the information on an individual's current labour market status to infer something about the unobservable components of market human capital. Full-time workers are predicted a wage from an equation run on the sample of full-time workers in the QLFS using the variables listed above. The predicted wage for full-time workers is hence

[16] Information on an individual's occupation and industry are available in both datasets. We do not use these variables in prediction, however, as there is evidence that individuals switch occupation and industry when moving between full- and part-time work (see Manning and Petrongolo, 2005, pp. 7-8). If this is the case then we should not hold these variables fixed when imputing full-time wages for non-full-time workers.
[17] Full-time and part-time status are self-defined in both the UKTUS and the QLFS.

$$\ln \hat{w}_{FTgi} = x_{FTgi}' \hat{\beta}_{FT,QLFS,g}$$

where $\hat{\beta}_{FT,QLFS}$ is the coefficient vector estimated on the QLFS, *i* indexes individuals and *g* indexes gender. No correction is made for work history as it is unavailable in the UKTUS, so the identifying assumption is made that the distribution of unobserved effects is the same for full-time workers in both the UKTUS and QLFS. If this assumption is valid, then the predicted wage is a consistent estimate of the individual's expected full-time wage.

For part-time and non-workers we explicitly assume that the full-time wage an individual could receive is lower than a current full-time worker with equivalent observable characteristics, for the reasons outlined above. This is operationalised by assuming that the potential wage of individuals in this group is a draw from the 25th percentile of the conditional full-time wage distribution. We use the technique of quantile regression to estimate the coefficients on observable characteristics at this point of the distribution, and then use these coefficients to predict the wage. The predicted wage for non-full-time workers is hence

$$\ln \hat{w}_{NON-FTgi} = x_{NON-FTgi}' \hat{\beta}^{25}_{FT,QLFS,g}$$

A similar technique has been used by Devereux (2004) amongst others to impute wages for non-working women. Details of the estimated parameters of the wage equations are given in Appendix Table A2. We choose this method largely because it directly incorporates the insights from theory that the potential full-time wages of individuals who have not chosen to work full-time will be lower than those observed amongst current full-time workers. A number of alternative methods for predicting wages are outlined in Appendix B, and the sensitivity of our results to the prediction method is explored in Section 5.4. A second reason for favouring the prediction method outlined here is that the assumption that wages fall at the 25 percentile is transparent and simple – the alternative methods outlined in Appendix B require a series of more complicated assumptions in order to derive the predicted wage.

Theoretical models of time allocation stress the importance of household non-labour income as well as wage rates in individual decision-making. Income that is exogenous to the labour supply decisions of the household members is not measured well in the UKTUS and is

unlikely to play an important role in the budget constraints of most families[18]. Benefit income should not be used as a control because means-testing ensures that it is not held fixed as labour supply decisions vary. A dummy for receipt of any rental or interest income by the household is our best available measure of exogenous household income. Its inclusion in the specification reported in Table 8 revealed no significant association with market or domestic labour supplies and so we choose not to include it in other specifications.

The use of variables such as education, health and region to predict the wage precludes their inclusion as explanatory variables in the labour supply equations. Clearly if all such variables were included as controls, they would be perfectly multi-collinear with the predicted wage. The inclusion of only a sub-set would enable estimation of the labour supply equations but would confuse the interpretation of the coefficients on the wage. This is because there is no idiosyncratic variation in predicted wages so there is virtually no overlap, for example, between the predicted wages of highly-educated and less-educated individuals. The inclusion of education as a control in addition to the wage then captures two off-setting effects. Highly-educated individuals appear to work less then less-educated individuals, but this is cancelled out by the fact that their uniformly higher predicted wages are associated with longer hours of work. An example of the impact of adding a selection of controls is shown in Table 8, but we do not emphasise these results because of the problem of interpretation. Note that the exclusion of education as a control in labour supply equations is not necessarily a drawback. Pencavel (1998) argues that the most interesting work-wage equations are those that do not hold education fixed. This is because individuals make schooling choices that affect wages and thus labour supply incentives. Part of the impact of wages on work hours will come via these schooling choices, which are netted out if schooling is held constant.

We do, however, make two exceptions to the rule of excluding control variables. We include detailed controls on the number and age of children in the household because it is the role of women in the bearing and rearing of children that is the basis for the argument that women have a biological advantage in domestic work (for example, because of the ability to

[18] There are no questions in the UKTUS on the amounts of income received from different sources (although there are yes/no questions on whether the household receives *any* income from a particular source). Gross household income is reported only in 11 broad groupings.

breastfeed). It also seems likely that social norms regarding appropriate gender roles work to differentiate the behaviour of parents in particular. The inclusion of controls for children can then throw light on the question of how important gender differences in the process of raising children are in explaining the overall gender division of labour. The second set of control variables is a set of 4 dummy variables capturing the broad age group of the individual. Whilst age does play a role in predicting the wage, there is sufficient within-group variation in the wage that the problem of collinearity is limited. The set of controls allow for systematic differences over the life-cycle in market and domestic work behaviour. As our data our cross-sectional, these age dummies are indistinguishable from cohort dummies and hence will also capture any effects of differing social norms between generations.

The final issue in our choice of explanatory variables comes in how the spouse's wage should enter an individual's labour supply equations. We specify work hours as a function of the *absolute* level of an individual's own wage and their wage *relative* to that of their spouse (i.e. work hours are a function of w_i and w_i/w_s where w_i is the individual's wage and w_s is the wage of his or her spouse). The first term captures the role of the wage as the value of non-market time in terms of foregone earnings. As the wage increases, individuals may find that the additional consumption generated by an hour's work at the margin is more than sufficient to compensate for an hour's reduction in domestic production and/or leisure. Gender wage differences would generate a gender division of labour via this mechanism, even if spouses behaved as isolated individuals with no potential for intra-household exchange. The relative wage term captures the degree to which the individual has an intra-household advantage or disadvantage in terms of earnings capacity. The higher an individual's relative wage, the greater the individual's incentive to substitute hours of market work for hours of domestic work and engage in intra-household trade. Higher relative wages may also be associated with greater intra-household bargaining power, although it is not clear how we would expect bargaining power to influence the allocation of time. Individuals may use their bargaining power to increase their hours of leisure, for example, but whether this comes at the expense of less market or less domestic work depends on the relative disutility of time in each sector.

Table 1 gives summary statistics on the variables used in our analysis. For the sample as a whole, we see that on average men spend around 44 hours a week in paid work and around

18 hours a week in unpaid work. Women spend on average only 26 hours a week in paid work - 18 hours less than men - but around 35 hours a week in unpaid work, or 17 hours more than men. Average leisure times are hence roughly equal. Virtually all men and women participated in some form of domestic work over the two diary days, but differential labour market participation rates play a substantial role in the magnitude of the market work gap. Male predicted wages are, on average, £1.60 an hour higher than women's predicted wages. Relative wages will be determined in part by this average gender wage gap but also by patterns of assortative mating. On average, the husbands in our sample have a predicted earnings capacity that is around 50 percent higher than the earnings capacity of their wives. Comparison of the age/cohort groups reveals that the bulk of our sample is aged between 26 and 55 and that husbands tend to be slightly older than their wives.

When we divide the sample into households with and without children, we find that the sexual division of labour is far more marked in families with children, but remains substantial even when no children are present. The paid work gap is around 25 hours a week when children are present, and around 10 hours a week in childless couples. Childless women are more likely to participate in the labour market than mothers, whilst the reverse is true of childless men with respect to fathers. The unpaid work gap mirrors the paid work gap across the two types of household, so that for both sub-groups average leisure times are again equal. Interestingly, male hours of unpaid work seem little affected by the presence of children - fathers spend on average just under two hours a week more in unpaid work than childless men. Mothers, however, spend around 15 hours a week more in unpaid work than their childless counterparts. It is notable that the average combined amount of household work hours over both sectors is larger in households where children are present, at around 130 hours for parents and 110 hours for childless couples. This difference reflects entirely a 20-hour differential in total domestic work, as total hours of market work are the same, on average, between the two groups at around 70. Greater gender specialisation amongst couples when children are present is accompanied by greater gender wage differences. The average male wage is £3.10 higher than the average female wage in the sample with children, but only £2 higher in the sample without children. These differences are reflected in intra-household relative wages, where the male advantage is substantially higher in households with children. Theory would suggest that the gains to a division of labour are greater when a) more work is

required in total and b) the wage differential between the spouses is larger. These summary statistics are consistent with the view that the degree of specialisation observed in practice is related to the magnitude of the potential gains to that specialisation. Whether this observation holds on an individual household level, however, cannot be inferred from the aggregate statistics.

The last columns of Table 1 provide summary statistics for the sample of two-earner couples. Even when both spouses participate in the labour market, substantial market and domestic work gaps of around 12 hours each emerge. Given that large gender wage differences are observed amongst this sub-sample, it appears that intra-household wage differences do not affect time allocation solely through labour market participation decisions, but also through hours of work conditional on participation.

4. Methodology

4.1 Decomposition methodology

Drawing on the method proposed by Yun (2004), we specify that the labour supply to sector *Y* of an individual of gender *g* in household *i* can be written

$$Y_{gi} = F(\mu_g, \mathbf{W}_{gi}) + \omega_{gi} \qquad (1)$$

$$i = 1,...,N \text{ households}$$

$$g = A, B \text{ (male and female)}$$

(The use of the *Y*, *A* and *B* notation allows the model to be generalised to incorporate both the market and domestic work gaps.) $F(\cdot)$ is a function left undefined at present; μ_g is a gender fixed effect; $\mathbf{W}_{gi}$ is a vector of variables capturing the individual's absolute and relative predicted wage rates; and ω_{gi} is a random error term that is orthogonal to the elements in $F(\cdot)$. We assume that ω_{gi} is mean-zero, and hence can write

$$\overline{Y_{gi}} = \overline{F(\mu_g, \mathbf{W}_{gi})}$$

where the 'over-bar' denotes the sample mean of a random variable over the population of individuals of gender *g*.

The difference in the sample means of *Y* by each gender group can be decomposed into:

$$\overline{Y_A} - \overline{Y_B} = \left\{\overline{F(\mu_A, \mathbf{W}_A)} - \overline{F(\mu_A, \mathbf{W}_B)}\right\} + \left\{\overline{F(\mu_A, \mathbf{W}_B)} - \overline{F(\mu_B, \mathbf{W}_B)}\right\} \qquad (2)$$

where we have dropped the household *i* subscript for convenience. The first term in curly brackets on the right-hand side of (2) is the 'wage effect' – it is the part of the gender gap in outcomes that would remain if individuals were essentially identical, and differed only in their absolute and relative wage rates. The second term in curly brackets is the 'gender effect' – the part of the gender gap in outcomes that would remain if absolute and relative wages were, on average, the same for both gender groups. It is clear that (2) gives only one of two possible decompositions. It uses the behaviour of gender group *A* as reference and calculates (i) how much of the gender gap in outcomes would remain if individuals of gender *B* supplied the same hours as individuals of gender *A* with the same absolute and relative wage (wage effect); and (ii) how much of the gender gap would remain if average absolute and relative

wages for both groups were equalised at the mean of group *B* individuals (gender effect). The alternative decomposition takes the behaviour of gender group *B* as reference, and asks: how much of the gender gap would remain if individuals of gender *A* supplied the same hours as individuals of gender *B* with the same wages, and how much would remain if, on average, wages of both were equalised at the mean of group *A* individuals? Formally, the alternative decomposition is:

$$\overline{Y_A} - \overline{Y_B} = \left\{\overline{F(\mu_B, \mathbf{W}_A)} - \overline{F(\mu_B, \mathbf{W}_B)}\right\} + \left\{\overline{F(\mu_A, \mathbf{W}_A)} - \overline{F(\mu_B, \mathbf{W}_A)}\right\}$$

All results in this paper are presented using first the male equation as reference and then the female equation.

Next we place the restriction on the way in which the arguments enter the function $F(\cdot)$ such that $F(\mu_g, \mathbf{W}_{gi}) = F(\mu_g + \mathbf{W}_{gi}'\beta_g) = F(\mu_g + w_{gi}\beta_g^w + r_{gi}\beta_g^r)$, where *w* is the absolute wage, *r* is the relative wage and β_g^w and β_g^r are their respective coefficients. Yun (2004) shows we can break down the overall wage effect into a component due to gender differences in absolute wages and a component due to gender differences in relative wages. The share of the wage effect that is accounted for by differences in absolute wages is given by

$$S_w = \frac{(\overline{w_A} - \overline{w_B})\beta_g^w}{(\overline{w_A} - \overline{w_B})\beta_g^w + (\overline{r_A} - \overline{r_B})\beta_g^r}$$

where the *g* subscript on the β's is equal to *A* if group *A* is the reference group and *B* if group *B* is the chosen reference group. The absolute wage effect reported in the results section is hence $S_w \times \left\{\overline{F(\mu_g, \mathbf{W}_A)} - \overline{F(\mu_g, \mathbf{W}_B)}\right\}$. The share of the wage effect accounted for by differences in relative wages is calculated similarly

$$S_r = \frac{(\overline{r_A} - \overline{r_B})\beta_g^r}{(\overline{w_A} - \overline{w_B})\beta_g^w + (\overline{r_A} - \overline{r_B})\beta_g^r}$$

The absolute wage effect give us an indication of how far higher average male wages influence the gender work gap via a higher cost to males of non-market time in terms of foregone earnings. The relative wage effect measures the importance of the average male intra-household wage advantage that generates gains to a traditional intra-household division of labour and may be associated with greater male intra-household bargaining power.

Demographic controls such as educational attainment are not included in our specification for the reasons outlined in Section 3.2. However, we do allow the gender fixed effect to vary with the number and age of children in the household and the age/cohort group of the individual. We specify

$$\mu_g = \eta_g + \mathbf{C}_i'\gamma_g + \mathbf{T}_{gi}'\lambda_g$$

where $\mathbf{C}_i$ is a vector of variables capturing the number and age of children (note there is no *g* subscript on $\mathbf{C}_i$ as $\mathbf{C}_i$ contains household-level variables), $\mathbf{T}_{gi}$ is as a set of dummies for each age/cohort group, γ_g and λ_g are their respective parameter vectors and η_g is a constant fixed gender effect that applies equally to all individuals of gender *g*.

Yun's detailed decomposition technique allows us to identify the share of the overall gender effect that relates to the differing behaviours of men and women when children are present in the household. The weight given to the 'child effect' in the overall gender effect (using group *g* as reference) is

$$S_C = \frac{\overline{\mathbf{C}}'(\gamma_A - \gamma_B)}{(\eta_A - \eta_B) + \overline{\mathbf{C}}'(\gamma_A - \gamma_B) + \left(\overline{\mathbf{T}_A}'\lambda_A - \overline{\mathbf{T}_B}'\lambda_B\right) + \overline{\mathbf{W}_{j\neq g}}'(\beta_A - \beta_B)}$$

and its overall magnitude is given by $S_C \times \left\{\overline{F(\mu_A, \mathbf{W}_{j\neq g})} - \overline{F(\mu_B, \mathbf{W}_{j\neq g})}\right\}$. The contribution of gender-specific behaviours surrounding children to the gender work gaps is of interest because it seems likely that both biology and social norms work to differentiate the behaviour of parents more strongly than the behaviour of childless individuals. The residual gender effect, i.e. the part not explained by gender differences surrounding children, can be thought of as an effect that applies to all individuals of a given gender, regardless of fertility.

Note that in traditional decomposition terminology, the fact that the men in our sample are, on average, slightly older than their spouses would form part of the 'characteristics' effects along with what we have termed the wage effect. The residual gap in outcomes, net of these two components, is traditionally termed the 'coefficients' effect. We choose to combine the effect of the gender age differential ($\overline{\mathbf{T}_A} - \overline{\mathbf{T}_B}$) with the coefficients effect in what we term the gender effect. We argue that the fact that women tend to marry men who are slightly older than themselves is best thought of as a gender effect, in the sense that it reflects a structural

difference in men's and women's behaviour, rather than an intrinsic difference in their characteristics.

4.2 Econometric model

Define

$$\mathbf{X}_{gi}'\theta_{Y,g} \equiv \eta_{Y,g} + \mathbf{C}_i'\gamma_{Y,g} + \mathbf{T}_{gi}'\lambda_{Y,g} + \mathbf{W}_{gi}'\beta_{Y,g}$$

where $Y = L, H$ indexes market and domestic labour supply respectively. We estimate a four-equation system of household labour supplies of the form

$$\begin{aligned} L_{gi} &= \mathbf{X}_{gi}'\theta_{L,g} + \varepsilon_{L,gi} && \text{if } \mathbf{X}_{gi}'\theta_{L,g} + \varepsilon_{L,gi} > 0 \\ &= 0 && \text{otherwise} \\ H_{gi} &= \mathbf{X}_{gi}'\theta_{H,g} + \varepsilon_{H,gi} \end{aligned} \qquad (3)$$

$i = 1,..., N$ households

$g = m, f$ (male and female)

The specification allows for the censoring of market labour supplies (*L*), but specifies household labour supplies (*H*) as a linear function of the independent variables because of the infrequency of limit observations – less than 1% of women and 4% of men report zero hours of household work on both diary days. In contrast, 13% of men and 30% of women do not participate in the labour market. The adoption of a linear functional form for market labour supplies, therefore, would bias the coefficient estimates towards zero (and more so for women than for men), leading to under-estimation of the wage and child effects. The form of these equations defines the choice of the $F(\cdot)$ function used in calculating the decompositions.

Since we can write

$$Y_{gi} = E(Y_{gi} \mid \mathbf{X}_{gi}, g) + \omega_{gi}$$

where ω_{gi} is a random mean-zero error term, it follows from (1) that the choice of $F(\cdot)$ function is $F(\mu_g, \mathbf{W}_{gi}) = E(Y_{gi} \mid \mathbf{X}_{gi}, g)$. For the simple linear case of domestic labour supply

this simplifies to $F^H(\mu_g, \mathbf{W}_{gi}) = \mathbf{X}_{gi}'\hat{\theta}_{H,g}$, where the H superscript denotes that the $F(\cdot)$ function is different for market and domestic labour supplies and a 'hat' over a coefficient denotes its estimated value. The domestic work gap can hence be written in standard linear decomposition form (using group g as the reference group) as:

$$\begin{aligned}
\overline{H}_f - \overline{H}_m &= \overline{F^H(\mu_f, \mathbf{W}_f)} - \overline{F^H(\mu_m, \mathbf{W}_m)} \\
&= \overline{\mathbf{X}}_f'\hat{\theta}_{H,f} - \overline{\mathbf{X}}_m'\hat{\theta}_{H,m} \\
&= \left(\overline{\mathbf{X}}_f - \overline{\mathbf{X}}_m\right)\hat{\theta}_{H,g} + \overline{\mathbf{X}}_{j\neq g}'\left(\hat{\theta}_{H,f} - \hat{\theta}_{H,m}\right) \\
&= \left\{\left(\overline{\mathbf{W}}_f - \overline{\mathbf{W}}_m\right)\hat{\beta}_{H,g}\right\} + \left\{\left(\overline{\mathbf{T}}_f - \overline{\mathbf{T}}_m\right)\hat{\lambda}_{H,g} + \overline{\mathbf{X}}_{j\neq g}'\left(\hat{\theta}_{H,f} - \hat{\theta}_{H,m}\right)\right\}
\end{aligned}$$

where the last line gives the wage effect as the first term in curly brackets and the gender effect in the second bracketed term. Application of the formulae for the detailed decompositions shows that the expressions for the absolute and relative wage effects and the child effect collapse to the familiar linear forms $(\overline{w_A} - \overline{w_B})\beta_g^w$, $(\overline{r_A} - \overline{r_B})\beta_g^r$, and $\overline{\mathbf{C}}'(\gamma_A - \gamma_B)$.

The tobit specification adopted to deal with the problem of censored market labour supplies means that the function $F^L(\mu_g, \mathbf{W}_{gi})$ is not a simple linear function of the independent variables. Rather, it takes the form of the expression for the expected value of a latent normal variable with mean $\mathbf{X}_{gi}'\theta_{L,g}$ that is censored from below at zero:

$$F^L(\mu_g, \mathbf{W}_{gi}) = E(L_{gi} \mid \mathbf{X}_{gi}, g) = \Phi\left(\hat{Z}_{gi}\right)\left(\mathbf{X}_{gi}'\hat{\theta}_{L,g} + \hat{\sigma}_{L,g}\frac{\phi(\hat{Z}_{gi})}{\Phi(\hat{Z}_{gi})}\right)$$

where $\hat{\sigma}_{L,g}$ is the estimated standard error of $\varepsilon_{L,gi}$; $\hat{Z}_{gi} = \left(\mathbf{X}_{gi}'\hat{\theta}_{L,g} / \hat{\sigma}_{L,g}\right)$; and $\phi(\cdot)$ and $\Phi(\cdot)$ are the standard normal density and cumulative distribution functions respectively.

Bauer and Sinning (2005) show that there are two possible methods of implementing the decomposition of a tobit model, depending on which $\hat{\sigma}_{L,g}$ is used in the counterfactual parts of the decomposition equation. Hence the counterfactual $F^L(\mu_A, \mathbf{W}_B)$, for example, may be estimated using $F^L(\hat{\theta}_A, \hat{\sigma}_A, \mathbf{W}_B)$ or $F^L(\hat{\theta}_A, \hat{\sigma}_B, \mathbf{W}_B)$. In this paper we employ the first of these two formulations. Bauer and Sinning implement an empirical example and show that in

that case, the tobit specification is an improvement over the OLS specification in general, but there are no significant differences in the results depending on which $\hat{\sigma}_{L,g}$ is used.

In order to estimate the model given in (3) we make the identifying assumptions that $Cov(\varepsilon_{Y,gi}, \mathbf{X}_{gi}) = 0$; $Y = L,H$; $g = m,f$. The error terms can hence be thought of as individual random effects that are, by construction, orthogonal to gender, spouses' predicted wage rates, age/cohort group and the presence of children. We allow for the fact that these random effects are likely to be correlated within a household, both for a given individual and between spouses, and produce estimates of these correlations. Specifically, we assume that the vector of error terms are jointly normally distributed, $\boldsymbol{\varepsilon}_i \sim NID(\mathbf{0}, \Sigma)$, where

$\boldsymbol{\varepsilon}_i = \begin{pmatrix} \varepsilon_{L,mi} & \varepsilon_{L,fi} & \varepsilon_{H,mi} & \varepsilon_{H,fi} \end{pmatrix}'$ and

$$\Sigma = \begin{pmatrix} \sigma^2_{L,m} & \sigma_{L,m,L,f} & \sigma_{L,m,H,m} & \sigma_{L,m,H,f} \\ \sigma_{L,m,L,f} & \sigma^2_{L,f} & \sigma_{L,f,H,m} & \sigma_{L,f,H,f} \\ \sigma_{L,m,H,m} & \sigma_{L,f,H,m} & \sigma^2_{H,m} & \sigma_{H,m,H,f} \\ \sigma_{L,m,H,f} & \sigma_{L,f,H,f} & \sigma_{H,m,H,f} & \sigma^2_{H,f} \end{pmatrix}$$

Estimation is carried out via maximum likelihood. The form of the contribution to the likelihood of each household *i* depends on whether one, both or none of the spouses' market labour supplies are censored. Define $\mathbf{y}^*_i = \begin{pmatrix} L^*_{mi} & L^*_{fi} & H^*_{mi} & H^*_{fi} \end{pmatrix}'$ as the vector of latent labour supplies. Our model specifies that observed labour supplies are given by

$$H_{gi} = H^*_{gi}$$

$$L_{gi} = L^*_{gi} \text{ if } L^*_{gi} > 0$$

$$L_{gi} = 0 \text{ if } L^*_{gi} \leq 0$$

Our assumption is that the joint density of $\mathbf{y}^*_i$ is multivariate normal, with mean-vector $\mathbf{X}_i'\theta = \begin{pmatrix} \mathbf{X}_{mi}'\theta_{L,m} & \mathbf{X}_{fi}'\theta_{L,f} & \mathbf{X}_{mi}'\theta_{H,m} & \mathbf{X}_{fi}'\theta_{H,f} \end{pmatrix}'$ and covariance matrix Σ, i.e. $f(\mathbf{y}^*_i) = NID(\mathbf{X}_i'\theta, \Sigma)$.

In the simplest case, both spouses participate in the labour market and the densities of observed and latent labour supplies coincide. The likelihood contribution of household *i* is simply:

$$L_i = f(\mathbf{y}_i) = (2\pi)^{-2}(\det\Sigma)^{-1/2}\exp\left\{-1/2(\mathbf{y}_i - \mathbf{X}_i'\theta)'\Sigma^{-1}(\mathbf{y}_i - \mathbf{X}_i'\theta)\right\}$$

Where at least one spouse does not participate in the labour market we must integrate over the part of the joint density that relates to negative values of the latent variables L^*_{mi} and/or L^*_{fi}. Define $\mathbf{y}_i^U$ as the vector of uncensored variables (H_{mi}, H_{fi} and possibly one of L_{mi} or L_{fi}) and $\mathbf{y}_i^{C*}$ as the vector of censored variables (one or both of L^*_{mi} and L^*_{fi}), such that $\mathbf{y}_i^* = \left(\mathbf{y}_i^{U\prime} \quad \mathbf{y}_i^{C*\prime}\right)'$. The likelihood contribution is given by $L_i = \int_{\{\mathbf{y}_i^{C*}:\mathbf{y}_i^{C*}\leq 0\}} f(\mathbf{y}_i^*)d\mathbf{y}_i^{C*}$.

The presence of the double integral in the likelihood contribution of no-earner households means that in this case it has no closed-form solution. We use the technique of maximum simulated likelihood to approximate the likelihood contribution in these cases (see Appendix C for further details of the MSL procedure). Calculations were performed in Stata 8.0 and maximise the user-defined log likelihood by the linear-form method. The number of replications used in simulating the likelihood is set at 20 (following Prowse, 2004). Starting values were derived from single-equation OLS estimates and estimates typically converged in around 9 iterations.

5. Results

5.1 Model selection

It is not clear a priori which is the correct functional form for specifying the relationship between absolute and relative wage rates and hours of work. An incorrect specification could lead to highly misleading estimates of the effects of wages on the allocation of time. We explore whether the absolute and relative wage terms should enter linearly, in logs or in quadratic form, and use the Akaike Information Criterion (AIC) to discriminate between non-nested models. The AIC statistic is calculated for each model using the formula

$$AIC = -2\ln(L) + 2(p+1)$$

where L is the likelihood and p is the number of elements in the parameter vector. The lower the AIC, the better the model[19]. Table 2 shows the AIC for seven models (ranked by AIC) and implies that the preferred model specifies that the absolute wage enters in quadratic form and the relative wage in log form. This, then, is the specification used throughout the paper.

5.2 Parameter estimates

Table 3 shows estimates of the model parameters for the full sample of 1170 couples. Note that marginal effects in the market work equations relate to the latent variable L^* and so are not directly comparable with marginal effects in the domestic work equations. Absolute wage variables are mean-centred around the mean for all individuals in the sample (£7.70 per hour). This has no effect on the magnitude or significance of the parameter estimates, the log likelihood, etc., but does give the constant a meaningful interpretation. In this case, the constant corresponds to the expected hours of work of a reference individual who is childless, age 36-45, with a wage of £7.70 per hour and a relative wage of 1 (i.e. equal wage to spouse).

The first two rows of Table 3 show that the level of an individual's potential earnings capacity is strongly associated with the allocation of time to both domestic and market work. The relationships are non-linear, and appear similar for both men and women. Figure 2 illustrates the relationships implied by the estimated coefficients for the reference individual. It shows that our estimates provide strong evidence of backward-bending market labour

[19] See for example Cameron and Trivedi (2005), pp. 278.

supply behaviour – past a certain point higher wages are associated with fewer hours supplied to the market, presumably as a result of income effects. This relationship holds for both men and women, although women supply less hours to the market than men at all wage rates. The gender difference in the relationship between wages and hours of market work is smaller amongst individuals with lower potential wages, all else constant, and becomes larger at higher wage rates. The plots for hours of domestic work show an opposite trend – individuals with higher wages spend less time in domestic work up to a point, beyond which further wage increases are associated with increases in time allocated to domestic work. Again, we see a similar relationship amongst both men and women, but with an intercept shift such that men spend less time in domestic work than women with identical wages.

Taken alongside the plots of market hours of work, Figure 2 suggests that domestic work contains an element of leisure, or joint production. For very low earners, the income gain from additional market hours is not sufficient to compensate for the loss of leisure and the output from domestic production. For slightly higher earners, the trade-off becomes favourable, and greater time in the market is chosen at the expense of both leisure and domestic work time. This suggests that to some degree purchased goods and services, financed by market work, can substitute for domestically-produced goods and services (through the purchase of labour-saving devices, childcare, restaurant meals, etc.). The potential for this type of substitution at moderate wage rates appears limited, however, as higher-wage individuals cut back on leisure time as well as domestic work. For very high-earners, additional hours of market work are again insufficient to compensate for lost leisure and domestic output. Once a desired level of income is attained, individuals prefer to consume leisure and produce domestic output rather than substitute additional earnings for non-market time. It seems likely that the composition of domestic work will be different among individuals with different wage rates. The domestic work undertaken by those with high wage rates can be thought of a luxury in the sense that it may require inputs of both time and money that together are outside the budget constraints of lower earners (home improvements, elaborate dinner parties, and food shopping in delicatessens rather than supermarkets may be examples). The hypothesis that domestic work can contain elements of

leisure has been explored both theoretically and empirically[20], and appears to be supported by Figure 2. Note that this contrasts with the assumption made in branches of the sociological literature that domestic work is a source of disutility that individuals seek to minimise via the exercise of bargaining power [21].

The remaining coefficients in Table 3 serve to shift the curves shown in Figure 2 vertically up or down. The coefficients of the relative wage reveal the striking feature that husbands' hours of work are insensitive to the earnings capacity of their wives. For women, however, the strength of their intra-household labour market position matters for the allocation of time. Wives whose earnings capacity exceeds their husband's, for example, work more in the market than more traditional wives and also spend less time in domestic work. It is difficult to view these results as evidence of a division of labour along the lines of comparative advantage. The logic of gains to specialisation suggests that, for a given number of market hours supplied by the household, total income will be maximised if the higher-earning partner contributes a higher share of those hours and the lower-earning partner a lower share. The greater the gap in earnings capacity between the spouses, the greater the incentive for a division of labour. Whilst we do find that women's market hours rise as the gain to male specialisation in market work falls, there is no accompanying reduction in male market hours or increase in male domestic hours. Hence there is little evidence that relatively high-earning wives specialise in market work and 'trade' earnings for increased domestic output produced by their husbands. Given the insensitivity of male labour supply, it is possible that we are observing an income effect – holding their own wage constant, women in households with relatively low-earning husbands must work longer in the market to enjoy the same levels of household income as women with higher-earning husbands. This suggests a model of behaviour termed the 'traditional family model' by Lundberg (1988). The model specifies an asymmetric pair of labour supply functions in which husband and wife maximise utility independently. Married men's decisions are a function of their own wage and household non-labour income alone, whilst married women treat men's earnings as a component of non-labour income when forming their labour supply decisions. As Lundberg argues, the

[20] See Pollak and Wachter (1975) for a theoretical discussion of joint production and Graham and Green (1984) and Kooreman and Kerkhofs (2003) for empirical treatments.
[21] Bianchi et al. (2000) provide a summary of the 'relative resources' perspective.

traditional family assumption has been common in both 'first-' and 'second-generation' empirical studies of labour supply, usually for reasons of convenience and data availability, despite the fact that it cannot be derived from optimising models of household behaviour. Lundberg suggests that the model can be thought of as an approximation to the case where changes in wife's market hours are a marginal substitution of market income for the value of home production and thus have an insignificant impact on household income. The results in Table 3 suggest that this approximation is not a bad one, as wives with lower-earning husbands, and hence lower 'other income' do appear to trade hours of domestic for hours of market work. If the relative wage is taken as an indicator of intra-household bargaining power, these results suggest that women with more power are able to substitute hours of domestic work with hours of market work. This interpretation is only valid, however, under the assumption that domestic work carries a disutility relative to market work.

The presence of children in the household is associated amongst women with large decreases in market labour supply and large increases in domestic labour supply. The magnitude of these effects diminishes with the age of the child, to the extent that the presence of a child age 10 to 15 is not associated with any reduction in market labour supply amongst women. Children have no significant effect on the market labour supply of men at all, which reinforces the finding that male labour supply decisions are made without reference to the characteristics of the household in which they live. Children, particularly those aged under 3, are associated with increases in men's domestic work, but of much smaller magnitudes than for women.

The set of age/cohort dummies in Table 3 allows for differences in time allocation that occur over the life-cycle, or because of changing social norms amongst younger generations. Both men and women in older age groups allocate less time to the market than those in younger generations, with a particularly sharp reduction after the age of 55. Older generations also allocate more time to domestic work than their younger counterparts, this being the case for both men and women.

Table 3 also contains estimates of the covariance parameters between the errors in the labour supply equations. Calculations of the standard errors and correlations implied by these

coefficients are provided below the estimates. Three of the cross-equation correlations between errors are significantly different from zero, which suggests that the simultaneous equation model is an improvement over single equation specifications. We can think of the errors as random, idiosyncratic effects that relate to unobserved differences in tastes and/or productivities. These random effects are, by construction, orthogonal to gender, household wage rates, the presence and age of children and age/cohort group. For both men and women, an individual's market and domestic work time errors are negatively correlated, as we would expect if purchased and domestically-produced goods are substitutes. We also find a significant positive correlation between the male and female labour supply errors. This suggests that there are complementarities in spousal market labour supply, perhaps because of shared tastes for consumption versus domestically-produced goods, or because of rigidities in the tax/benefit system and variations in local labour market conditions. There is no evidence of intra-household, as opposed to individual specialisation. If specialisation were important we would expect to find negative correlations between spouses' labour supplies to the market, and/or to the domestic sector. This pattern would arise if, for example, spouses divided a given amount of work hours according to which partner was most productive. Equally, we find no evidence of intra-household trade, in the sense that individuals who work unusually long hours in one sector do not tend to be compensated by higher spousal labour supply to the alternative sector.

5.3 Decomposition results

Table 4 presents the results of the decomposition of the market and domestic work gaps. The estimates in the first and third columns use the male behavioural response as reference. We can think of this as a counterfactual scenario in which women supply the same hours of labour as men with the same observed characteristics. Once we adjust for the fact that the wives in the sample are somewhat younger than husbands, in this scenario spouses differ only in their earnings capacity in the labour market. Hence the 'wage effect' is the remaining gap in work times that can be attributed solely to gender differences in wage rates. The female reference equation takes the opposite counterfactual – that the behaviour of husbands with a given absolute and relative wage, age, and number and age of children is the same as the behaviour of wives with the same characteristics. Results using both reference equations are presented here, and hence show the sensitivity of our results to the underlying behavioural

assumption. The detailed decomposition allows us to explore how far the wage effect reflects differences in the absolute earnings capacities of individuals and how far it reflects intra-household incentives for a traditional sexual division of labour. We also isolate the impact of gender-specific behaviours surrounding children, which gives some indication of how far gender differences in biological and cultural constraints are associated with parenthood, and how far they apply to all men and women regardless of fertility.

The decomposition of the market work gap shows that gender differences in earnings ability can account for around 7.5 hours, or just under half, of the overall 17.7 hour gap. The estimates are remarkably consistent whether the male or female equation is used as reference. This suggests that gender wage differences play an important role in the couples' time allocation decisions with respect to market work. Regardless of gender, individuals with higher earnings capacity allocate more time to market work. Nevertheless, just over half of the market work gap would persist even if the earnings capacities of men and women were, on average, equal. The decomposition of the domestic work gap shows a wage effect that is smaller and varies more with the choice of reference equation. Somewhere between one-sixth and one-third of the domestic work gap is explained by the fact that higher-wage individuals devote less time to domestic work. It appears that female specialisation in domestic work can be explained only partially by the fact that the foregone earnings associated with an hour of non-market time are lower for women than for men. Wages are of second-order importance in domestic labour supply as an individual's sex is a far stronger predictor of their time allocation.

These results suggest that differences in the wage rates of individuals, regardless of gender, can account for a large fraction of the observed male specialisation in market work amongst married couples. These wage differences are less strongly associated with female specialisation in domestic work, however. Gender-specific biological and cultural constraints work to maintain a traditional division of labour in both sectors, but more so within the home than in the labour market. This implies that trends towards the equalisation of wage rates between the sexes will have a lop-sided impact of the sexual division of labour. Rates of labour market participation and hours of work will become more equal, but female responsibility for domestic tasks will be eroded to a lesser degree. This, of course, will slow

change in the labour market – women's demand for part-time work and occupational segregation will not be seriously challenged whilst women must juggle market and domestic production. It also suggests that trends towards gender equality in wages and market work hours will be associated with a reduction in women's leisure time, as the degree to which purchased goods and services can substitute for domestic output appears limited.

The detailed decomposition of the market work wage effect suggests the role of the absolute wage outweighs that of the relative wage in explaining gender differences in market work. Gender differences in the amount of income generated by an hour of market work account for between 29 and 44 percent of the overall market work gap, whilst differences in intra-household advantages in market work account for between –2 and 14 percent of the gap. (The figure of –2 can be interpreted in terms of an effect that reduces, rather than adds to, the overall gap. Men who have a relative intra-household disadvantage in market work tend to work more, rather than less, in the market than men who have an advantage relative to their partner. Hence if women were to behave as men, their average relative disadvantage would lead them to supply more hours to the market than men, all else equal.) These results suggest that women work less in the market principally because the additional income generated by more market work is not sufficient to compensate for the accompanying reduction in leisure and/or the reduction in domestic output. This implies that at higher wage rates, the trade-off would become more favourable, and women would choose to supply more labour to the market, perhaps using part of their additional earnings to purchase market-substitutes for domestic output such as childcare or prepared meals. The fact that the gains to intra-household specialisation would be reduced as women's wages rise to the level of men's appears relatively unimportant – the size of the intra-household wage gap has only a minor influence on the way in which spouses choose to allocate market time.

In contrast, the detailed decomposition of the wage effect in domestic work shows that intra-household wage differences are equally, if not more, important in determining the allocation of time to domestic work than variations in the absolute level of the wage. Households in which the gain to a division of labour is greater exhibit a greater degree of specialisation in domestic work. Hence the fact that men have an intra-household wage advantage accounts for between 7 and 25 percent of the overall domestic work gap. In fact, as our discussion of the

underlying model estimates in Table 3 revealed, it seems to be only the behaviour of women that is modified in response to differences in the earnings capacities of the spouses. Where the gain to a traditional division of labour is smaller, women tend to allocate their time more equally between the market and the domestic sphere. There is no evidence, however, that the work times of men become equalised between the two sectors in response to a fall in the gains to traditional specialisation.

Turning to the effects of children on time allocation, we see that gender-specific differences in the labour supply of parents accounts for around a third of the market work gap and for a slightly higher proportion of the domestic work gap. If spouses modified market labour supply by the same amount when children are present in the household, relative to the hours they would supply in the absence of children, the gender gap in market work would shrink by around five and half hours and the gap in domestic work by around six hours. Elimination of these differences in behaviour between men and women would reduce the market work gap by about the same magnitude as elimination of gender wage differences, but would have a relatively larger impact on the domestic work gap. Gender differences in market work are largest when children aged under 3 are present in the household and are virtually zero for children aged 10 and above. Gaps in domestic work vary somewhat less with the age of children. Whether the differential responses reflect biological differences in ability at caring for children, cultural norms or gender differences in preferences is impossible to say. It is notable, however, that even when differential responses to the presence of children are netted out, a substantial unexplained gender effect remains that is common to all individuals of a given sex. Hence it seems likely that biological differences in comparative advantage between men and women, which presumably relate largely to differences in childbirth and child-rearing, are insufficient to explain the observed division of labour.

5.4 Sensitivity analysis

Table 5 explores the robustness of the decomposition estimates to the definition of market and domestic work (full model estimates are given in Appendix Table A3). The top panel shows our original estimates for comparison. The second panel shows the effect of excluding travel and commuting time from our definitions of market and domestic work. The magnitude of the market and domestic work gaps fall by around 2 hours a week each, suggesting that

travel times are proportional to the number of hours spent working in each sector. Men spend longer, on average, commuting to market work than women, and so excluding travel-to-work time narrows estimates of gender differences in market labour supply. Similarly, women spend longer than men, on average, in travel related to household and family care and this additional travel time contributes to the domestic work gap. Estimates of the relative contributions of wage effects and of gender-specific behaviours surrounding children to the observed gaps are virtually unchanged, however.

The third panel of Table 5 explores the effects of including secondary time uses in the definition of domestic and market work. This increases the magnitudes of both the market and domestic work gaps, but more so for the domestic work gap which rises by around 4 hours per week. This suggests that women engage in 'multi-tasking' to a greater degree than men, and are more likely to combine domestic work tasks with leisure activities. The contribution of gender differences surrounding children to the domestic work gap is slightly larger in these estimates, which is consistent with the combination of childcare with other domestic tasks. Estimates of relative magnitudes of the wage and gender effects, however, are again largely unchanged.

The final panel of Table 5 follows Bianchi et al. (2000) in recoding extreme values that are likely to introduce error into reports of time use. We recode all estimates that are extremely high (exceeding the 95th percentile of the distribution) back to the 95th percentile. Bianchi et al. argue that this truncation of the range helps to eliminate the most error-prone estimates from the data. The recoding leads to a reduction in the size of both gaps, but a larger reduction in the domestic than the market work gap. The relative magnitudes of the wage and gender effects, however, do not appear sensitive to the presence of outliers.

Table 6 explores the robustness of the decomposition estimates to differing assumptions regarding the prediction of individual wages. Full details of the different methodologies used are given in Appendix B and model estimates are given in Appendix Table A4. Again, our preferred estimates are given in the top panel for comparison. Table 7 gives summary statistics on the wage distributions produced under each assumption.

The decompositions shown in the second, third and fourth panels of Table 6 give somewhat smaller estimates of the impact of gender wage differences in explaining the market and domestic work gaps than our preferred specification, whilst the estimates in the last panel are somewhat larger. It is noticeable that in each case, however, the contribution of wage differences to the market work gap is greater than to the domestic work gap, suggesting that our finding of asymmetric effects between the market and domestic sectors is robust. Note also that in each case, the absolute level of an individual's earnings capacity is relatively more important than their intra-household wage position in determining market labour supply, whilst the reverse is true for domestic labour supply.

As Table 7 makes clear, the first three alternative methods result in the highest predictions of average female potential wages, and hence the smallest gender wage gaps. As discussed in Appendix B, each method attempts to tackle the problem of unobserved heterogeneity between full-time and non-full-time workers in a different way. In each of these three cases, however, it seems likely that we over-predict the potential full-time wages that would be available to individuals who do not currently work full-time. For example, controlling for differences in average months of continuous employment (estimates shown in the second panel) will correct for short-term differences in experience-related human capital between full-time workers and non-full-time workers, but not for longer-term differences in work history or unobserved differences in ability or productivity.

The Heckman-correction approach attempts to account for such factors in a parametric way, but is hampered by the lack of a valid exclusion restriction and possible misspecification of the underlying distribution of unobserved effects. As discussed in Appendix B, the Heckman selection term is negative in the female wage equation which implies that women who work full-time earn slightly lower wages than would be available to women with equivalent observable characteristics who choose not to work full-time. This finding contradicts theoretical notions that individuals with positive tastes for work should both earn higher wages and be more likely to work full-time. The finding is particularly suspect in this case because we do not control for differences in work history or job tenure because they are unavailable in the UKTUS. The implication of the Heckman estimates for women is then that the (presumably) greater labour market attachment of full-time workers is associated with

lower wages, which seems nonsensical.

The method shown in the fourth panel of Table 6 uses the wages of full-time workers who have been in their current employment for less than 6 months as the basis for the prediction of the potential wages of non-full-time workers. This method accounts for the lack of firm-specific human capital amongst new entrants into full-time work, but again does not take into consideration that the unobserved characteristics of those beginning new full-time jobs are likely to be relatively positive, compared to individuals who have chosen not to work full-time at all.

Our preferred specification allows directly for the relatively negative characteristics of non-full-time workers by assuming that the wage such an individual could receive, if they were to seek a full-time job, is a draw from the 25^{th} percentile of the conditional full-time wage distribution. Thus our method imposes a single transparent assumption about the unobserved heterogeneity between full-time and non-full-time workers that is in accordance with theories of individual utility maximisation. The choice of the 25^{th} percentile is, of course, to some degree arbitrary, but represents a relatively conservative estimate of the wage penalty experienced by non-full-time workers. As Table 7 shows, gender wage differences are largest when we employ this method in general, and become even larger when the 10^{th}, rather than the 25^{th}, percentile is used. It is unsurprising, then, that the decomposition shown in the bottom panel of Table 6, gives the largest estimates of the impact of gender wage differences on the intra-household division of labour.

Table 8 presents results for the model with an additional set of demographic controls that are commonly included in market and domestic labour supply equations. As argued in Section 3.2, the inclusion of such controls is inappropriate in the sense that it confuses the interpretation of the wage coefficients. Given that age, education and health status are used in the prediction of wage rates there is insufficient idiosyncratic variation in the wage to identify its impact separately to that of the demographic controls. To see this, note that the estimates in Table 8 suggest that an individual's level of education is strongly negatively correlated with market work and strongly positively correlated with domestic work. But since highly-educated individuals have, by construction, higher wages than those with less education, the

coefficients on education are countered by wage effects of the opposite sign. Similarly, the inclusion of controls for relative education leads to an increase in the coefficient on the relative wage. Men who are more highly educated than their wives, for example, appear to spend less time in market work. But such men will have high relative wages and, according to the increased coefficient on this variable, spend longer in market work, thus cancelling out the relative education effect.

Home and car ownership status are not used in the prediction of wage rates, but again are likely to confuse interpretation of the wage variables, as they depend on household income and are thus an outcome of household labour supply decisions. The negative association of rented tenure and market labour supply, for example, may simply reflect the fact that low-wage individuals supply less labour to the market and hence have lower household income. Controlling for housing tenure thus removes part of the wage effect but housing tenure cannot be considered to be held constant as wages vary. The dummy for interest or rental income included in Table 8 is not statistically significant in any of the labour supply equations. As discussed in Section 3.2, this dummy is the best available measure we have of 'household non-labour income', i.e. income that is exogenous with respect to the labour supply decisions of the household. Receipt of benefit income is not included as means-testing ensures that, again, this is an outcome of the time allocation decision.

5.5 Contrasting results for households with and without children

Tables 9a and 9b contrasts models estimated separately on the sub-samples of households with and without children. Lundberg (1988) finds striking differences in the market labour supply behaviour of spouses depending on whether or not young children are present in the household. It is certainly the case in our data that the degree of specialisation is greater when children are present – the market and domestic work gaps are of the order of 24 hours a week amongst couples with children and only 9 hours a week amongst couples without children. Hence we present separate results here, although the smaller sample sizes associated with the sub-models mean that results must be treated with caution.

One striking result from this analysis is that the sensitivity of female labour supply to intra-household wage differences is found only amongst women with children. The point estimates

of the effects are thus about twice the magnitude found when the model is estimated on the combined sample. Women who are capable of earning the same or more than their husband allocate time more equally between the domestic and market sectors than women who are able to earn substantially less than their husbands. The effect is not symmetrical – men whose earning capacity is the same or less than their wife's do not allocate work time more equally than husbands with an intra-household wage advantage. In households without children, individual time allocation decisions are not modified at all depending on the earnings capacity of the spouse, but respond only to the absolute level of the individual's wage.

The market labour supply of men varies little with age/cohort group, regardless of whether children are present, the exception being the reduced market hours of childless men aged 56 and above[22]. Younger fathers allocate substantially less time to domestic work than older fathers, whilst amongst childless men it is only those in the oldest age/cohort group who significantly increase hours of domestic work. Neither market nor domestic hours of mothers vary substantially with age, but amongst childless women, younger cohorts allocate far more time to the market, partly at the expense of less time in domestic work.

The correlations between the idiosyncratic errors also show marked differences according to the presence of children. In both cases, individual work errors are negatively correlated for both men and women, indicating that market and domestic work hours are substitutes. Male and female market labour supply errors are also positively correlated in both sub-samples, suggesting that spousal complementarities in market work are common to households with and without children. We also find evidence of spousal complementarities in domestic production, but only amongst childless couples. Hence even when we restrict our analysis to families with children where gender specialisation is greatest, we find no evidence of an intra-household division of labour on the basis of unobserved tastes or productivities. The greatest contrast in the behaviour of the two types of couple is found in the correlations between one spouse's market hours and the other spouse's domestic hours. Amongst couples with children, both of these correlations are significantly positive. This symmetry suggests that if one spouse works unusually long hours in the market, they are compensated by greater

[22] Note that as there are no women in the sample who are aged over 55 and have children, the two highest age categories are combined into one for the sub-sample with children.

domestic work hours on the part of their spouse. In contrast, amongst childless couples, households in which the wife supplies greater market hours than we would predict on the basis of her observable characteristics are characterised by lower hours of male domestic work. The equivalent correlation between male market work and female domestic work is not significantly different from zero. It is possible to interpret this result in terms of the 'gender display' perspective in which men with high-earning wives spend less time in domestic work in order to neutralise the challenge to traditional gender stereotypes. Alternatively, it may be the case that higher female earnings are used to purchase goods and services that substitute for male domestic production. If this interpretation is valid, it is noticeable that male earnings do not appear to be used to buy substitutes for female domestic work in the same way.

Tables 10a and 10b present the results for the decompositions of the market and domestic work gaps in the two types of household. It is notable that the gender effect on time allocation, net of the child effect, is roughly similar in both types of household. Around 6 to 7 hours of the market work gap in households with children is attributable neither to gender-specific behaviours surrounding children, nor to gender wage differences, whilst the comparable figure for households without children is around 4 hours. Similarly, pure gender effects account for around 6 to 10 hours of the domestic work gap in households with children and 7 to 8 hours in households without children. Gender differences in wages, however, generate differences in time allocation that are much larger in households with children than in those without. This is partly because wage differentials are larger between parents than childless individuals (see Table 1), but also because parents' labour supplies are sensitive the intra-household wage differential. The difference is particularly noticeable with respect to domestic labour supply, where gender wage differences generate 5 to 10 hours of the domestic work gap between parents, but only 2 hours or less of the gap between childless spouses.

As the descriptive statistics in Table 1 revealed, households with children allocate, on average, about the same number of hours to the market in total as households without children, but around 20 hours more to domestic work. The greater amount of total work carried out by parents increases the gains to a division of labour, and intra-household differences in earnings capacities play an important role the degree of specialisation that is

optimal for the household. As our discussion of the underlying model parameters suggested, it is the allocation of women's time that responds the most to differences in comparative wage advantages – households in which husband and wife have similar wage rates see a more equal division of female time between the market and domestic sectors. These results lead to the surprising conclusion that the equalisation of male and female wage rates would impact on the sexual division of labour more in households where children are present than when they are not. The incentives to allocate time efficiently in such households are greater than in households without children, and hence could work more strongly to counteract biological and cultural pressures to a sexual division of labour. Amongst households without children, the degree of specialisation as measured by size of the market and domestic work gaps is far smaller. Gender wage differences can account for a large fraction of the differences in market labour supplies, but cultural and biological factors are of primary importance in determining the residual degree of female specialisation in domestic work.

5.6 Results for two-earner couples

Much research into the time allocation of couples abstracts from the labour market participation decision and restricts its focus to two-earner couples[23]. Whilst this may have advantages in terms of limiting the degree of unobserved heterogeneity in the sample and bypassing the need to impute wage rates for non-workers, it ignores an important dimension of the sexual division of labour. Single- and no-earner couples make up one third of our sample, although the sub-samples of the three types of household in this group (male sole-earner, female sole-earner and no-earner) are too small to analyse separately. We do, however, present results for the sample of two-earner couples to see how far our conclusions are affected by the inclusion of non-participants in the labour market.

Table 11 presents estimates of the model parameters for the sub-sample of two-earner couples. Coefficients are comparable between the market and domestic work equations here as there is no censoring of market labour supply. It is immediately noticeable that the hours of market work of both men and women are insensitive to the absolute level of the individual's potential full-time wage (estimates are of the expected sign but small and imprecisely determined). There is, however, some evidence that higher-wage women spend

[23] e.g. Alvarez and Miles (2003), Hersch and Strattion (1997), Kooreman and Kapteyn (1987).

slightly less time in domestic work than lower-wage women. Given the insensitivity of female market hours, this may reflect the substitution of goods purchased with their higher earnings for time in domestic production. A comparison of these estimates with those given for the full sample in Table 3 suggests that variation in individual wage levels impacts primarily on decision-making in households in which at least one spouse does not work in the market. For women, this effect relates primarily to the decision of whether or not to participate in the labour market as only 11% of the women excluded from the two-earner sample are workers. For men, the effect relates to both the participation decision and the hours of work decision as 60% of men excluded from the two-earner sample are workers. Estimation on the sub-sample of two-earner couples with non-missing actual net wages (derived directly from the time use data sample) are shown in Appendix Table A5. These estimates are subject to the endogeneity problems relating to the non-linear nature of the tax system and part-time wage offers described in Section 3.2. Examination of the results does suggest, however, that the lack of absolute wage effects found for this group is not an artefact of the method used to predict wages.

Our previous finding that the division of female work between the market and domestic sectors is responsive to variations in the intra-household relative wage is replicated in Table 11 for women in two-earner couples. As discussed above, this effect seems restricted to women with children. The decision of whether to work part- or full-time amongst women with working husbands, then, seems to depend more on the level of husbands' earnings than on the wife's earnings capacity in the labour market.

The number and age of children in the household remains a significant predictor of both female market and domestic hours even when both spouses work in the market. Again, male market labour supply is insensitive to the presence of children whilst male domestic labour supply does increase significantly, particularly when young children are present. Estimates of the error correlations at the bottom of Table 11 show that we find no evidence of spousal complementarities in either domestic or market work in the sample of two-earner couples. Hence the finding in other specifications that spouses' market work errors are positively correlated seems to capture solely the concentration of two-earner (66%) and no-earner couples (9%) in the data.

Results of the decomposition in the market and domestic work gaps for two-earner couples are given in Table 12. Note that gender specialisation is extensive even when both spouses work in the market, with gaps of around 12 hours per week in both sectors. The estimated magnitude of the wage effect is highly dependent on which behavioural equation is used as reference. The insensitivity of male labour supplies to both own and spouse's wages imply that if all individuals behaved as men with a given set of characteristics virtually no gender difference in work times would remain. If all individuals behaved as women, however, men who have, on average, an intra-household wage advantage would supply more hours to the market than women and less hours to the domestic sector. When we take the female equations as reference, we again find that the magnitude of the wage effect is smaller in explaining the domestic work gap than in explaining the market work gap.

6. Conclusions

This paper explores the role played by gender wage differences in explaining the observed gender division of labour. We hypothesised that the division of labour between two spouses may be insensitive to their absolute and relative wage rates because biological differences and social norms generate an intrinsic female comparative advantage in domestic work. Our findings in fact point to a conclusion that is more subtle than this simple formulation allows. On one hand, we find evidence of large gender fixed effects that result in women performing far more domestic work than men with similar wage rates and, to a lesser extent, men performing more market work than women with similar wages. These gender effects are far stronger in households where children are present, but are substantial even net of the effect of children on behaviour. This suggests that intrinsic differences in domestic productivity between men and women or social norms lead spouses to specialise in a traditional manner.

On the other hand, we find that for both sexes, higher earnings capacity is associated with a substitution away from domestic work and domestic output and towards market work and the goods and services that can be purchased with earned income. This finding implies that rising female wages will be associated with a reduction in the division of labour. The fact that higher-wage individuals increase market labour supply at the expense of leisure as well as domestic production means that higher female wages would be associated with a larger reduction in the market work gap than in the domestic work gap, and hence a reduction in overall female leisure time.

This summary, however, fails to highlight the asymmetries in male and female labour supply behaviour. We have argued that our results are most consistent with the 'traditional family model' that effectively treats women as secondary earners. The labour supply behaviour of women, or more specifically of mothers, is responsive to the intra-household wage differential between spouses whilst the labour supply of men is not. This means that in households where the earnings capacities of the spouses are relatively more equal, women allocate time more equally between the market and domestic sectors and hence exhibit patterns of time use that are more similar to those of their husbands. We find no evidence, however, that men's time allocation between the two sectors is more equal when earnings

capacities are more equal. This finding suggests that whilst gender specialisation would be reduced by increased female wages, this will come largely via the substitution of purchased goods and services for the domestic tasks normally carried out by women, rather than via the substitution of male domestic work for female domestic work. Put another way, it seems that female earnings are used to buy substitutes for female domestic work, but not to free husbands' time from market work that could then be used in the domestic sector. This is the case even when the wife's wage is greater than the husband's wage, and hence suggests that either men's productivity in the domestic sector is below that of market alternatives, or that the disutility suffered by men were they to specialise in the domestic sector is so great that it outweighs the income gain from the wife's higher earnings. On balance, it seems unlikely that a gender-neutral model that characterises spouses simply in terms of their relative market and domestic productivities is sufficient to account for the degree of gender specialisation we observe in practice. Whilst rising female wages may lead to a reduction in the division of labour, a substantial gender division of labour would exist even if, on average, there were no gender wage differences. Fundamental differences in gender roles are important determinants of individual behaviour and generate pressures towards a gender division of labour, whatever the relative productivities (narrowly-defined) of husbands and wives.

A number of other conclusions can be drawn from our supplementary analyses. Firstly, the relationship between an individual's earnings capacity and their market and domestic labour supplies is highly non-linear. In particular, the finding that individuals with very high wage rates choose to supply more domestic labour than individuals with moderate wage rates suggests that, given sufficient income, domestic work can contain an important component of leisure. The assumption that domestic work is always a source of disutility, combined with the linear specification common to many models, appears to obscure an important facet of behaviour. At wage rates that are currently available to most married couples it is true that higher wages are associated with greater market labour supply and lower domestic labour supply. General increases in productivity that raise wages in the long-term, however, may lead to a reverse substitution away from the market and towards the domestic sector.

Secondly, we find important differences in the labour supply behaviour of parents compared with childless couples. In childless couples, gender fixed effects are substantially larger in the

domestic sector than in the market sector. A large fraction of women's lower labour supply to the market sector is explained by their lower absolute wage rates, whereas the division of domestic labour in childless couples is largely insensitive to the spouses' earnings capacities. In contrast, the allocation of time in households with children is determined much more strongly by the wage differential between the spouses, and this is the case for domestic as well as market work. We have speculated that the greater amount of work carried out by parents in total creates stronger incentives to allocate time efficiently. Nevertheless, gender-specific behaviours surrounding children are equally as important as wages differences in the allocation of parents' time.

Thirdly, we find markedly smaller absolute wage effects when we restrict our sample to two-earner couples. The only impact of gender differences in earning capacities is via the relative wage on female time allocation. As noted above, where the wages of the spouses are more equal, women divide their time more equally between the market and domestic sectors. This suggests that differences in the absolute earnings capacities of spouses play a particularly important role in the decision-making of single- and no-earner couples. Studies which focus exclusively on two-earner couples for methodological convenience may thus give a misleading picture of the role of wages in the labour supply decisions of men and women more generally.

Finally, our methodology produces estimates of the correlations between the idiosyncratic components of spouses' market and domestic labour supplies. We find no evidence of a division of labour on the basis of unobserved tastes or productivities, in the sense that unusually high hours of work by one spouse in a given sector are not associated with lower hours of work by the other spouse. Instead, we find evidence of spousal complementarities in market labour supply that appear to be driven by the prevalence of two-earner and no-earner couples. We do, however, find correlations that point to intra-household trade amongst parents. Individuals who allocate more hours to the labour market than we would predict on the basis of their observed characteristics tend to have spouses who allocate more time to domestic work, and this is the case whether it is the husband or wife who works longer in the labour market. In contrast, the excess labour supply of childless women is associated with less domestic work on the part of their husbands, perhaps because female earnings are spent

differentially from male earnings on substitutes for domestic production.

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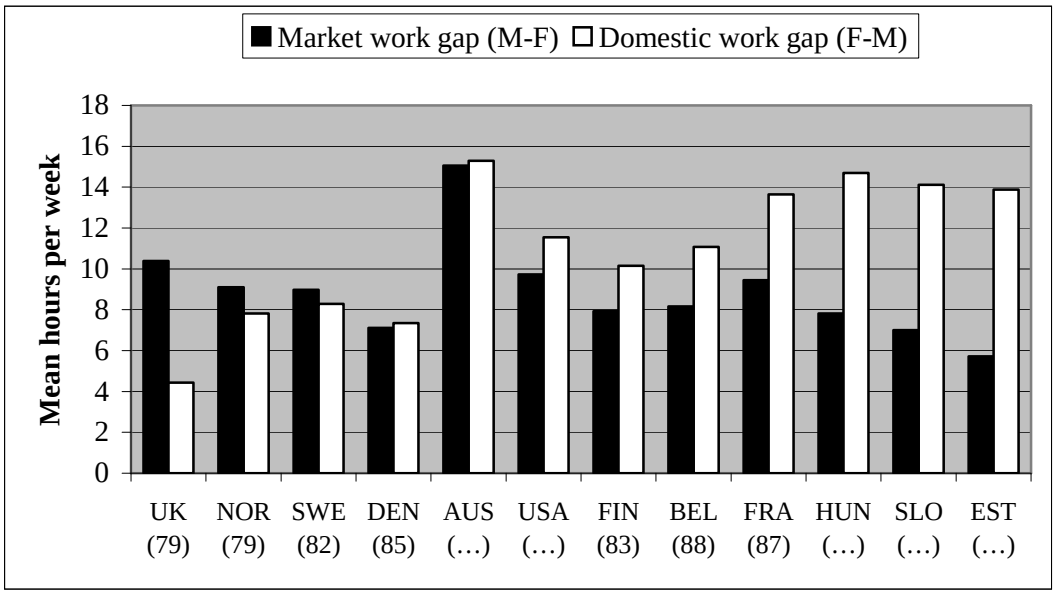
Figure 1. The gender division of labour in 12 developed countries

(Gender pay ratio in brackets)



Notes

Sources: Eurostat (2003), Table 1; US Dept. of Labor (2005), Table 1; Australian Bureau of Statistics (1998), Table 1; Commission of the European Communities (2003), Table 1.
Year of collection of time use data varies from 1997 (Australia) to 2004 (USA). Time use surveys were not fully comparable across all countries. Gender pay ratios are for the year 2000.

Figure 2. Estimated relationships between absolute wage and hours of work

(childless individuals, age 36-45, relative wage = 1)

Table 1. Summary statistics for variables used in analysis

Figures are means over the relevant sample

	Full sample		Households with children		Households without children		Two-earner households	
	Males	Females	Males	Females	Males	Females	Males	Females
N	1170		633		537		768	
(% total sample)	(100%)		(54%)		(46%)		(66%)	
Market work (Weekly hours)	43.9	26.1	46.8	22.1	40.5	30.8	49.9	37.6
Market work (Participation rate)	0.88	0.70	0.91	0.64	0.82	0.76	-	-
Market work gap	17.8		24.7		9.7		12.3	
Domestic work (Weekly hours)	17.9	34.6	18.7	41.8	16.9	26.0	16.2	28.7
Domestic work (Participation rate)	0.97	1.00	0.97	1.00	0.97	0.99	0.97	1.00
Domestic work gap	16.7		23.1		9.1		12.5	
Predicted absolute wage (£ per hour)	8.99	6.40	9.28	6.18	8.66	6.65	9.47	6.97
Predicted relative wage	1.49	0.77	1.58	0.72	1.39	0.83	1.45	0.79
Proportion aged:								
18-25	0.05	0.09	0.04	0.08	0.06	0.10	0.04	0.08
26-35	0.29	0.35	0.34	0.45	0.24	0.23	0.32	0.37
36-45	0.32	0.28	0.45	0.39	0.16	0.14	0.33	0.29
46 to 55	0.20	0.20	0.14	0.07	0.26	0.36	0.21	0.21
56+	0.14	0.08	0.02	0.00	0.29	0.18	0.10	0.05
Number of children aged:								
0-2	0.18		0.33		-		0.12	
3-4	0.13		0.24		-		0.09	
5-9	0.36		0.66		-		0.32	
10-15	0.38		0.70		-		0.39	

Table 2. Model selection using the Akaike information criterion (AIC)

Absolute wage variable	Relative wage variable	AIC
level, squared	ln	36013.5
level, squared	level	36020.6
ln	ln	36021.4
level, squared	level, squared	36023.7
ln	level	36028.4
ln	level, squared	36030.1
level	ln	36094.0

Notes

$AIC = -2\ln(L) + 2(p+1)$ where L is the likelihood and p is the number of elements in the parameter vector. The lower the AIC, the better the model.

Table 3. Model estimates, full sample

(Absolute z-statistics in brackets)

	Market work (weekly hours)				Domestic work (weekly hours)			
	Males		Females		Males		Females	
Absolute wage	9.29	***	12.83	***	-2.07	***	-2.59	***
	(8.59)		(8.07)		(3.60)		(2.81)	
(Absolute wage)^2	-0.34	***	-0.58	***	0.08	***	0.11	**
	(7.14)		(6.02)		(3.29)		(1.99)	
Ln(relative wage)	-0.59		4.75	*	-1.82		-6.23	***
	(0.24)		(1.96)		(1.42)		(4.52)	
# Children age 0-2	-0.79		-18.24	***	6.47	***	17.48	***
	(0.43)		(8.75)		(6.70)		(15.53)	
# Children age 3-4	1.87		-12.59	***	0.04		10.25	***
	(0.87)		(5.27)		(0.04)		(7.77)	
# Children age 5-9	-0.59		-6.90	***	1.84	***	7.21	***
	(0.48)		(5.19)		(2.84)		(9.58)	
# Children age 10-15	-1.12		-0.20		0.36		2.78	***
	(0.99)		(0.17)		(0.60)		(3.91)	
Age 18-25	5.69		5.49	*	-5.38	***	-3.63	*
	(1.55)		(1.66)		(2.71)		(1.92)	
Age 26-35	1.38		5.77	***	-2.38	**	-3.68	***
	(0.70)		(2.80)		(2.25)		(3.08)	
Age 46-55	-2.56		3.12		1.83		2.81	*
	(1.19)		(1.27)		(1.58)		(1.96)	
Age 56+	-20.27	***	-11.28	***	6.11	***	3.59	*
	(7.63)		(3.24)		(4.39)		(1.80)	
Constant	41.32	***	32.19	***	17.00	***	24.41	***
	(21.87)		(15.60)		(16.87)		(20.47)	
$\sigma^2_{L,m}$, $\sigma^2_{L,f}$, $\sigma^2_{H,m}$, $\sigma^2_{H,f}$	602.24	***	648.05	***	169.46	***	228.16	***
	(21.31)		(19.17)		(24.19)		(24.18)	
Implied standard errors	*24.54*		*25.46*		*13.02*		*15.11*	
$\sigma_{L,m,H,m}$, $\sigma_{L,f,H,f}$	-177.51	***	-236.86	***				
	(15.88)		(16.68)					
Implied correlation coefficients	*-0.56*		*-0.62*					
$\sigma_{L,m,L,f}$, $\sigma_{H,m,H,f}$	109.33	***	5.84					
	(5.37)		(1.01)					
Implied correlation coefficients	*0.18*		*0.03*					
$\sigma_{L,m,H,f}$, $\sigma_{L,f,H,m}$	18.17		4.33					
	(1.64)		(0.42)					
Implied correlation coefficients	*0.05*		*0.01*					
Log Likelihood	-17947.742							
N	1170							

Notes

Absolute wage variables are mean-centred around the mean for the sample of men and women as a whole (£7.70 p.h.). Omitted age group is 36-45. Hence the constant has the interpretation of the mean hours of work for a childless individual age 36-35, with a wage of £7.70 p.h. and a relative wage of 1 (i.e. equal wage to spouse).
Marginal effects in the market work equations relate to the latent variable L^* and so are not directly comparable with marginal effects in the domestic work equations.
***, **, and * indicate significance at the 1%, 5% and 10% levels respectively

Table 4: Decomposition of market and domestic work gaps, full sample, N = 1170

Figures are percentage of total gap (figures in brackets are weekly hours of work)

	Market work				Domestic work			
	Male reference equation		Female reference equation		Male reference equation		Female reference equation	
Wage effect	**42**	**(7.5)**	**43**	**(7.7)**	**16**	**(2.7)**	**34**	**(5.7)**
Of which:								
Absolute wage	44	(7.9)	29	(5.2)	9	(1.5)	9	(1.5)
Relative wage	-2	(-0.4)	14	(2.5)	7	(1.2)	25	(4.1)
Gender effect	**58**	**(10.2)**	**57**	**(10.0)**	**84**	**(14.0)**	**66**	**(11.0)**
Of which:								
Responses to children	31	(5.5)	33	(5.9)	37	(6.1)	37	(6.1)
Of which:								
Age 0-2	*14*	*(2.4)*	*15*	*(2.7)*	*12*	*(1.9)*	*12*	*(1.9)*
Age 3-4	*8*	*(1.5)*	*9*	*(1.6)*	*8*	*(1.3)*	*8*	*(1.3)*
Age 5-9	*10*	*(1.8)*	*11*	*(2.0)*	*12*	*(1.9)*	*12*	*(1.9)*
Age 10-15	*-2*	*(-0.3)*	*-2*	*(-0.3)*	*6*	*(0.9)*	*6*	*(0.9)*
Total	**100**	**(17.7)**	**100**	**(17.7)**	**100**	**(16.7)**	**100**	**(16.7)**

Table 5. Robustness of estimates to definitions of market and domestic work, full sample, N = 1170

Figures are percentage of total gap (figures in brackets are weekly hours of work)

	Market work				Domestic work			
	Male reference equation		Female reference equation		Male reference equation		Female reference equation	
Preferred specification								
Wage effect	**42**	**(7.5)**	**43**	**(7.7)**	**16**	**(2.7)**	**34**	**(5.7)**
Of which:								
Absolute wage	44	(7.9)	29	(5.2)	9	(1.5)	9	(1.5)
Relative wage	-2	(-0.4)	14	(2.5)	7	(1.2)	25	(4.1)
Gender effect	**58**	**(10.2)**	**57**	**(10.0)**	**84**	**(14.0)**	**66**	**(11.0)**
Of which:								
Responses to children	31	(5.5)	33	(5.9)	37	(6.1)	37	(6.1)
Total	**100**	**(17.7)**	**100**	**(17.7)**	**100**	**(16.7)**	**100**	**(16.7)**
Excluding travel time								
Wage effect	**43**	**(6.7)**	**44**	**(6.0)**	**18**	**(2.6)**	**33**	**(4.9)**
Of which:								
Absolute wage	44	(6.9)	29	(4.6)	8	(1.3)	9	(1.4)
Relative wage	-1	(-0.2)	15	(2.4)	9	(1.4)	23	(3.5)
Gender effect	**57**	**(9.0)**	**56**	**(8.7)**	**82**	**(12.4)**	**67**	**(10.1)**
Of which:								
Responses to children	29	(4.5)	31	(4.9)	34	(5.1)	34	(5.1)
Total	**100**	**(15.7)**	**100**	**(15.7)**	**100**	**(15.1)**	**100**	**(15.1)**
Including secondary time use								
Wage effect	**42**	**(7.2)**	**46**	**(8.3)**	**12**	**(2.4)**	**36**	**(7.4)**
Of which:								
Absolute wage	45	(8.1)	29	(5.3)	5	(1.0)	5	(1.0)
Relative wage	-3	(-0.5)	17	(3.1)	7	(1.5)	31	(6.4)
Gender effect	**58**	**(10.6)**	**54**	**(9.8)**	**88**	**(18.3)**	**64**	**(13.3)**
Of which:								
Responses to children	31	(5.7)	34	(6.2)	41	(8.5)	41	(8.5)
Total	**100**	**(18.1)**	**100**	**(18.1)**	**100**	**(20.7)**	**100**	**(20.7)**
Correcting for outliers								
Wage effect	**43**	**(7.3)**	**43**	**(7.3)**	**17**	**(2.7)**	**34**	**(5.3)**
Of which:								
Absolute wage	47	(7.9)	31	(5.2)	9	(1.5)	10	(1.6)
Relative wage	-3	(-0.6)	12	(2.1)	8	(1.2)	23	(3.7)
Gender effect	**57**	**(9.6)**	**57**	**(9.6)**	**83**	**(13.3)**	**66**	**(10.6)**
Of which:								
Responses to children	31	(5.2)	33	(5.6)	34	(5.4)	34	(5.4)
Total	**100**	**(16.9)**	**100**	**(16.9)**	**100**	**(16.0)**	**100**	**(16.0)**

Table 6. Robustness of estimates to method used to predict wages, full sample, N = 1170

Figures are percentage of total gap (figures in brackets are weekly hours of work)

	Market work				Domestic work			
	Male reference equation		Female reference equation		Male reference equation		Female reference equation	
Split sample, 25 percentile*								
Wage effect	**42**	**(7.5)**	**43**	**(7.7)**	**16**	**(2.7)**	**34**	**(5.7)**
Of which:								
Absolute wage	44	(7.9)	29	(5.2)	9	(1.5)	9	(1.5)
Relative wage	-2	(-0.4)	14	(2.5)	7	(1.2)	25	(4.1)
Gender effect	**58**	**(10.2)**	**57**	**(10.0)**	**84**	**(14.0)**	**66**	**(11.0)**
Of which:								
Responses to children	31	(5.5)	33	(5.9)	37	(6.1)	37	(6.1)
Total	**100**	**(17.7)**	**100**	**(17.7)**	**100**	**(16.7)**	**100**	**(16.7)**
Controls for imputed job tenure								
Wage effect	**17**	**(3.0)**	**36**	**(6.4)**	**10**	**(1.6)**	**22**	**(3.6)**
Of which:								
Absolute wage	30	(5.3)	20	(3.6)	4	(0.7)	5	(0.8)
Relative wage	-13	(-2.3)	16	(2.8)	6	(0.9)	17	(2.8)
Gender effect	**83**	**(14.7)**	**64**	**(11.3)**	**90**	**(15.1)**	**78**	**(13.1)**
Of which:								
Responses to children	36	(6.3)	37	(6.6)	39	(6.6)	39	(6.6)
Total	**100**	**(17.7)**	**100**	**(17.7)**	**100**	**(16.7)**	**100**	**(16.7)**
Heckman-corrected								
Wage effect	**27**	**(4.8)**	**2**	**(0.4)**	**8**	**(1.4)**	**7**	**(1.2)**
Of which:								
Absolute wage	16	(2.9)	7	(1.3)	1	(0.2)	3	(0.4)
Relative wage	11	(1.9)	-5	(-0.9)	7	(1.2)	5	(0.8)
Gender effect	**73**	**(13.0)**	**98**	**(7.4)**	**92**	**(15.2)**	**93**	**(15.5)**
Of which:								
Responses to children	42	7.5	44	7.8	43	(7.2)	43	(7.2)
Total	**100**	**(17.7)**	**100**	**(17.7)**	**100**	**(16.7)**	**100**	**(16.7)**
Split sample, new entrant wages								
Wage effect	**32**	**(5.7)**	**34**	**(6.0)**	**13**	**(2.1)**	**24**	**(4.1)**
Of which:								
Absolute wage	36	(6.4)	24	(4.2)	6	(0.9)	6	(1.0)
Relative wage	-4	(-0.7)	10	(1.8)	7	(1.2)	18	(3.0)
Gender effect	**68**	**(12.0)**	**66**	**(11.7)**	**87**	**(14.6)**	**76**	**(12.6)**
Of which:								
Responses to children	36	(6.3)	38	(6.7)	47	(7.8)	47	(7.8)
Total	**100**	**(17.7)**	**100**	**(17.7)**	**100**	**(16.7)**	**100**	**(16.7)**
Split sample, 10 percentile								
Wage effect	**72**	**(12.8)**	**58**	**(7.3)**	**25**	**(4.2)**	**48**	**(7.9)**
Of which:								
Absolute wage	67	(11.9)	47	(8.4)	16	(2.7)	17	(2.8)
Relative wage	5	(1.0)	11	(1.9)	9	(1.6)	31	(5.1)
Gender effect	**28**	**(4.9)**	**42**	**(7.4)**	**75**	**(12.5)**	**52**	**(8.8)**
Of which:								
Responses to children	21	(3.7)	25	(4.4)	31	(5.2)	31	(5.2)
Total	**100**	**(17.7)**	**100**	**(17.7)**	**100**	**(16.7)**	**100**	**(16.7)**

(Continued overleaf)

Notes

	Method used to predict gross full-time wages for:	
	Full-time workers	Part-time workers and non-participants
Split sample, 25 percentile (preferred specification)	Conditional mean of sample of full-time workers	Conditional 25th percentile of sample of full-time workers
Controls for imputed job tenure	Conditional mean of sample of full-time workers, controls for work experience, work experience imputed from sample of full-time workers	Conditional mean of sample of full-time workers, controls for work experience, work experience imputed from sample of part-time workers for part-timers, zero for non-participants
Heckman-corrected	Heckman-corrected conditional mean of sample of full-time workers, number and age of children used for identification	Heckman-corrected conditional mean of sample of full-time workers, number and age of children used for identification
Split sample, new entrant wages	Conditional mean of sample of full-time workers	Conditional mean of sample of full-time workers in current job for less than 6 months
Split sample, 10 percentile	Conditional mean of sample of full-time workers	Conditional 10th percentile of sample of full-time workers

Table 7. Summary statistics on predicted wage variables

	Split sample, 25 percentile	Controls for imputed job tenure	Heckman-corrected	Split sample, new entrant wages	Split sample, 10 percentile
Mean wage gap	2.60	2.12	1.54	2.32	3.03
Male wages					
Mean	8.99	8.88	8.97	9.06	8.73
S.D.	3.54	3.33	3.67	3.52	3.71
p10	5.18	5.45	4.82	5.37	4.40
p90	14.21	13.91	14.51	14.38	14.21
Female wages					
Mean	6.40	6.76	7.43	6.74	5.70
S.D.	2.45	2.43	2.56	2.53	2.51
p10	3.93	4.31	4.94	4.13	3.29
p90	9.99	10.44	11.29	10.39	9.21
Male/female relative wages					
Mean	1.49	1.38	1.25	1.42	1.68
S.D.	0.58	0.47	0.45	0.53	0.76
p10	0.89	0.89	0.72	0.88	0.87
p90	2.24	1.98	1.82	2.09	2.65

Table 8. The effect of including additional controls on model estimates

Coefficients in bold relate to the preferred parsimonious specification shown in Table 2.3

	Market work				Domestic work			
	Males		Females		Males		Females	
Absolute wage	8.59 ***	**9.29*** **	13.78***	**12.83*** **	-2.89***	**-2.07*** **	-2.63**	**-2.59*** **
(Absolute wage)^2	-0.23 ***	**-0.34*** **	-0.48***	**-0.58*** **	0.09***	**0.08*** **	0.07	**0.11** **
Ln(relative wage)	6.99 **	**-0.59**	8.52**	**4.75** *	-2.22	**-1.82**	-9.55***	**-6.23*** **
# Children age 0-2	-2.80	**-0.79**	-17.97***	**-18.24*** **	7.01***	**6.47*** **	17.45***	**17.48*** **
# Children age 3-4	0.42	**1.87**	-12.27***	**-12.59*** **	0.54	**0.04**	10.38***	**10.25*** **
# Children age 5-9	-1.93 *	**-0.59**	-5.87***	**-6.90*** **	2.22***	**1.84*** **	6.79***	**7.21*** **
# Children age 10-15	-1.83 *	**-1.12**	1.64	**-0.20**	0.45	**0.36**	2.16***	**2.78*** **
Age 18-25	11.46 ***	**5.69**	13.29***	**5.49** *	-6.55***	**-5.38*** **	-4.49**	**-3.63** *
Age 26-35	3.61 *	**1.38**	8.44***	**5.77*** **	-2.98***	**-2.38** **	-3.92***	**-3.68*** **
Age 46-55	-0.66	**-2.56**	-0.68	**-3.12**	1.15	**1.83**	1.84	**2.81** *
Age 56+	-12.85 ***	**-20.27*** **	-6.81*	**-11.28*** **	3.24**	**6.11*** **	1.09	**3.59** *
Degree	-23.79 ***		-25.68***		8.29***		5.85**	
A-level	-7.53 ***		-11.55***		4.20***		-0.16	
Education missing	10.33		-16.41		3.55		4.84	
Higher education than spouse	-7.42 ***		-1.99		0.60		4.09**	
Lower education than spouse	3.35		0.90		-0.01		-2.80**	
Relative education missing	-3.88		-1.74		-4.44		-0.36	
Age difference from spouse	-0.18		0.18		0.13		0.07	
Long-term health problem	-12.40 ***		-3.84**		2.08**		-0.38	
Spouse has long-term health problem	-0.34		-0.27		0.51		-0.41	
Owns home outright	-6.00 ***		-5.84**		2.34*		4.89***	
Rents housing	-4.47 **		-13.63***		-0.61		1.86	
Any income from interest or rent	0.56		-2.22		-0.43		0.65	
Use of car	8.56 ***		1.65		1.09		3.68**	
Constant	41.06 ***	**41.32*** **	44.25***	**32.19*** **	13.80***	**17.00*** **	18.17***	**24.41*** **
Log likelihood	-17753.982	**-17947.742**						
N	1170	**1170**						

Notes

Absolute wage variables are mean-centred around the mean for the sample of men and women as a whole (£7.70 p.h.). Omitted age group is 36-45. Hence the constant in the parsimonious specifications has the interpretation of the mean hours of work for a childless individual age 36-35, with a wage of £7.70 p.h. and a relative wage of 1 (i.e. equal wage to spouse). In the equations with full controls, the omitted groups are: Education = GCSE/none; Individual has same education level as spouse; Housing tenure is mortgaged. Hence the constant relates to individuals with these additional characteristics, who also are the same age as their spouse; who neither suffer from a long-term health problem nor have a spouse with a long-term health problem; and who live in households that do not receive income from interest or rent and do not have the use of a car.

Marginal effects in the market work equations relate to the latent variable L^* and so are not directly comparable with marginal effects in the domestic work equations.

***, **, and * indicate significance at the 1%, 5% and 10% levels respectively

Table 9a.Model estimates, sample of households with children

(Absolute z-statistics in brackets)

	Market work (weekly hours)				Domestic work (weekly hours)			
	Males		Females		Males		Females	
Absolute wage	9.01	***	12.70	***	-2.68	***	-2.35	*
	(6.48)		(5.26)		(3.36)		(1.65)	
(Absolute wage)^2	-0.33	***	-0.59	***	0.11	***	0.11	
	(5.63)		(3.98)		(3.20)		(1.19)	
Ln(relative wage)	1.56		8.97	***	-3.41	*	-9.94	***
	(0.48)		(2.60)		(1.83)		(4.99)	
# Children age 0-2	-3.56	*	-18.63	***	5.79	***	13.87	***
	(1.66)		(7.01)		(4.80)		(9.64)	
# Children age 3-4	0.04		-12.92	***	-0.59		7.71	***
	(0.02)		(4.77)		(0.47)		(5.09)	
# Children age 5-9	-2.50	*	-7.76	***	1.22		5.23	***
	(1.75)		(4.60)		(1.50)		(5.44)	
# Children age 10-15	-3.53	**	-1.31		-0.61		0.61	
	(2.42)		(0.76)		(0.73)		(0.60)	
Age 18-25	7.48		-3.44		-7.57	**	0.95	
	(1.46)		(0.65)		(2.56)		(0.32)	
Age 26-35	0.23		4.57	*	-3.30	**	-2.33	
	(0.10)		(1.75)		(2.43)		(1.51)	
Age 46+	-3.89		-1.45		4.16	***	2.93	
	(1.43)		(0.34)		(2.65)		(1.14)	
Constant	45.99	***	35.49	***	19.78	***	27.73	***
	(15.32)		(9.74)		(11.53)		(13.12)	
$\sigma^2_{L,m}$, $\sigma^2_{L,f}$, $\sigma^2_{H,m}$, $\sigma^2_{H,f}$	530.58	***	681.04	***	176.19	***	251.24	***
	(16.25)		(13.73)		(17.79)		(17.79)	
Implied standard errors	*23.03*		*26.10*		*13.27*		*15.85*	
$\sigma_{L,m,H,m}$, $\sigma_{L,f,H,f}$	-179.35	***	-269.55	***				
	(12.36)		(12.72)					
Implied correlation coefficients	*0.59*		*0.65*					
$\sigma_{L,m,L,f}$, $\sigma_{H,m,H,f}$	54.97	**	-12.91					
	(2.10)		(1.53)					
Implied correlation coefficients	*0.09*		*-0.06*					
$\sigma_{L,m,H,f}$, $\sigma_{L,f,H,m}$	33.34	**	37.65	**				
	(2.26)		(2.57)					
Implied correlation coefficients	*0.09*		*0.11*					
Log Likelihood	-9653.4997							
N	633							

Notes

Absolute wage variables are mean-centred around the mean for the sample of men and women as a whole (£7.73 p.h.). Omitted age group is 36-45. Hence the constant has the interpretation of the mean hours of work for a childless individual age 36-35, with a wage of £7.73 p.h. and a relative wage of 1 (i.e. equal wage to spouse).
Marginal effects in the market work equations relate to the latent variable L^* and so are not directly comparable with marginal effects in the domestic work equations.
***, **, and * indicate significance at the 1%, 5% and 10% levels respectively

Table 9b. Model estimates, sample of households without children

(Absolute z-statistics in brackets)

	Market work (weekly hours)				Domestic work (weekly hours)			
	Males		Females		Males		Females	
Absolute wage	9.80	***	12.21	***	-1.64	*	-2.58	**
	(5.43)		(5.73)		(1.92)		(2.20)	
(Absolute wage)^2	-0.35	***	-0.53	***	0.06		0.11	
	(4.27)		(4.22)		(1.53)		(1.61)	
Ln(relative wage)	-3.00		0.57		0.61		-1.86	
	(0.79)		(0.17)		(0.34)		(1.01)	
Age 18-25	4.06		12.53	***	-4.16		-8.01	***
	(0.73)		(2.85)		(1.54)		(3.29)	
Age 26-35	2.89		6.80	*	-1.47		-6.38	***
	(0.79)		(1.91)		(0.82)		(3.21)	
Age 46-55	-2.71		-2.47		1.49		2.57	
	(0.76)		(0.73)		(0.86)		(1.37)	
Age 56+	-18.26	***	-9.96	**	5.71	***	3.57	
	(4.89)		(2.48)		(3.22)		(1.65)	
Constant	39.71	***	30.25	***	15.87	***	25.60	***
	(12.92)		(10.27)		(10.74)		(15.88)	
$\sigma^2_{L,m}$, $\sigma^2_{L,f}$, $\sigma^2_{H,m}$, $\sigma^2_{H,f}$	705.11	***	600.01	***	160.01	***	186.63	***
	(13.77)		(13.42)		(16.38)		(16.38)	
Implied standard errors	*26.55*		*24.50*		*12.65*		*13.66*	
$\sigma_{L,m,H,m}$, $\sigma_{L,f,H,f}$	-182.13	***	-191.42	***				
	(10.32)		(10.79)					
Implied correlation coefficients	*-0.54*		*-0.57*					
$\sigma_{L,m,L,f}$, $\sigma_{H,m,H,f}$	179.98	***	29.25	***				
	(5.49)		(3.85)					
Implied correlation coefficients	*0.28*		*0.17*					
$\sigma_{L,m,H,f}$, $\sigma_{L,f,H,m}$	-8.31		-39.43	***				
	(0.51)		(2.73)					
Implied correlation coefficients	*-0.02*		*-0.13*					
Log Likelihood	-8237.7655							
N	537							

Notes

Absolute wage variables are mean-centred around the mean for the sample of men and women as a whole (£7.65 p.h.). Omitted age group is 36-45. Hence the constant has the interpretation of the mean hours of work for a childless individual age 36-35, with a wage of £7.65 p.h. and a relative wage of 1 (i.e. equal wage to spouse).

Marginal effects in the market work equations relate to the latent variable L^* and so are not directly comparable with marginal effects in the domestic work equations.

***, **, and * indicate significance at the 1%, 5% and 10% levels respectively

Table 10a. Decomposition of market and domestic work gaps, sample of households with children, N = 633

Figures are percentage of total gap (figures in brackets are weekly hours of work)

	Market work				Domestic work			
	Male reference equation		Female reference equation		Male reference equation		Female reference equation	
Wage effect	**41**	**(10.1)**	**41**	**(10.1)**	**21**	**(4.9)**	**40**	**(9.2)**
Of which:								
Absolute wage	36	(8.9)	19	(4.7)	10	(2.2)	6	(1.4)
Relative wage	5	(1.2)	22	(5.5)	12	(2.7)	34	(7.8)
Gender effect	**59**	**(14.7)**	**59**	**(14.6)**	**79**	**(18.2)**	**60**	**(13.9)**
Of which:								
Responses to children	30	(7.4)	34	(8.4)	35	(8.1)	35	(8.1)
Of which:								
Age 0-2	*15*	*(3.7)*	*17*	*(4.1)*	*11*	*(2.6)*	*11*	*(2.6)*
Age 3-4	*9*	*(2.3)*	*11*	*(2.6)*	*9*	*(2.0)*	*9*	*(2.0)*
Age 5-9	*11*	*(2.6)*	*12*	*(2.9)*	*11*	*(2.7)*	*11*	*(2.7)*
Age 10-15	*-5*	*(-1.2)*	*-5*	*(-1.3)*	*4*	*(0.9)*	*4*	*(0.9)*
Total	**100**	**(24.7)**	**100**	**(24.7)**	**100**	**(23.1)**	**100**	**(23.1)**

Table 10b. Decomposition of market and domestic work gaps, sample of households without children, N = 537

Figures are percentage of total gap (figures in brackets are weekly hours of work)

	Market work				Domestic work			
	Male reference equation		Female reference equation		Male reference equation		Female reference equation	
Wage effect	**54**	**(5.1)**	**56**	**(5.2)**	**9**	**(0.8)**	**24**	**(2.2)**
Of which:								
Absolute wage	69	(6.4)	53	(5.0)	13	(1.1)	14	(1.3)
Relative wage	-15	(-1.4)	3	(0.3)	-3	(-0.3)	11	(1.0)
Gender effect	**46**	**(4.3)**	**44**	**(4.1)**	**91**	**(8.3)**	**76**	**(6.9)**
Total	**100**	**(9.4)**	**100**	**(9.4)**	**100**	**(9.1)**	**100**	**(9.1)**

Table 11. Model estimates, sample of two-earner couples

(Absolute z-statistics in brackets)

	Market work (weekly hours)				Domestic work (weekly hours)			
	Males		Females		Males		Females	
Absolute wage	1.42		1.25		-0.49		-1.94	**
	(1.40)		(1.02)		(0.70)		(2.00)	
(Absolute wage)^2	-0.05		-0.02		0.02		0.09	
	(1.24)		(0.35)		(0.70)		(1.54)	
Ln(relative wage)	-0.99		7.35	***	-0.39		-4.23	***
	(0.49)		(3.93)		(0.29)		(2.84)	
# Children age 0-2	0.45		-8.05	***	7.31	***	14.14	***
	(0.25)		(4.68)		(5.95)		(10.33)	
# Children age 3-4	0.29		-3.57	*	1.33		7.31	***
	(0.14)		(1.84)		(0.96)		(4.74)	
# Children age 5-9	-0.31		-4.51	***	2.24	***	7.30	***
	(0.28)		(4.39)		(3.02)		(8.95)	
# Children age 10-15	0.20		-1.17		0.09		3.48	***
	(0.21)		(1.29)		(0.14)		(4.83)	
Age 18-25	-5.55	*	4.20	*	-2.01		-4.33	**
	(1.72)		(1.70)		(0.91)		(2.20)	
Age 26-35	0.00		1.46		-2.78	**	-2.23	*
	(0.00)		(0.96)		(2.52)		(1.85)	
Age 46-55	-0.74		-3.31	*	0.84		4.28	***
	(0.42)		(1.82)		(0.69)		(2.96)	
Age 56+	-5.81	**	-3.93		2.09		4.18	*
	(2.46)		(1.31)		(1.29)		(1.75)	
Constant	50.64	***	44.09	***	15.23	***	20.98	***
	(33.25)		(29.57)		(14.64)		(17.73)	
$\sigma^2_{L,m}$, $\sigma^2_{L,f}$, $\sigma^2_{H,m}$, $\sigma^2_{H,f}$	278.70	***	249.58	***	129.45	***	158.12	***
	(19.59)		(19.60)		(19.59)		(19.59)	
Implied standard errors	*16.69*		*15.80*		*11.38*		*12.57*	
$\sigma_{L,m,H,m}$, $\sigma_{L,f,H,f}$	-102.27	***	-121.00	***				
	-13.14		-14.42					
Implied correlation coefficients	*-0.54*		*-0.61*					
$\sigma_{L,m,L,f}$, $\sigma_{H,m,H,f}$	7.68		5.66					
	0.80		1.09					
Implied correlation coefficients	*0.03*		*0.04*					
$\sigma_{L,m,H,f}$, $\sigma_{L,f,H,m}$	19.54	**	11.56	*				
	2.56		1.78					
Implied correlation coefficients	*0.06*		*0.09*					
Log Likelihood	-12114.093							
N	768							

Notes

Absolute wage variables are mean-centred around the mean for the sample of men and women as a whole (£8.22 p.h.). Omitted age group is 36-45. Hence the constant has the interpretation of the mean hours of work for a childless individual age 36-35, with a wage of £8.22 p.h. and a relative wage of 1 (i.e. equal wage to spouse).
Marginal effects in the market work equations relate to the latent variable L^* and so are not directly comparable with marginal effects in the domestic work equations.
***, **, and * indicate significance at the 1%, 5% and 10% levels respectively

Table 12. Decomposition of market and domestic work gaps, sample of two-earner couples, N = 768

Figures are percentage of total gap (figures in brackets are weekly hours of work)

	Market work				Domestic work			
	Male reference equation		Female reference equation		Male reference equation		Female reference equation	
Wage effect	**4**	**(0.4)**	**53**	**(6.5)**	**4**	**(0.5)**	**27**	**(3.4)**
Of which:								
Absolute wage	8	(1.0)	16	(2.0)	2	(0.3)	7	(0.9)
Relative wage	-5	(-0.6)	36	(4.5)	2	(0.2)	21	(2.6)
Gender effect	**96**	**(11.9)**	**47**	**(5.8)**	**96**	**(12.1)**	**73**	**(9.1)**
Of which:								
Responses to children	27	(3.3)	27	(3.3)	34	(4.3)	34	(4.3)
Of which:								
Age 0-2	*9*	*(1.1)*	*9*	*(1.1)*	*7*	*(0.8)*	*7*	*(0.8)*
Age 3-4	*3*	*(0.4)*	*3*	*(0.4)*	*4*	*(0.6)*	*4*	*(0.6)*
Age 5-9	*11*	*(1.3)*	*11*	*(1.3)*	*13*	*(1.6)*	*13*	*(1.6)*
Age 10-15	*4*	*(0.5)*	*4*	*(0.5)*	*10*	*(1.3)*	*10*	*(1.3)*
Total	**100**	**(12.3)**	**100**	**(12.3)**	**100**	**(12.5)**	**100**	**(12.5)**

Appendix A: Supplementary tables

Appendix Table A1: Sample selection criteria

(Percentage of total sample in parentheses)

Total sample of households	6414	(100%)		
Excluded observations due to:				
No married/cohabiting couples (both aged 18 or more) in household			2494	(39%)
2 or more married/cohabiting couples (both aged 18 or more) in household			21	(0%)
Remaining	3899	(61%)		
Excluded observations due to:				
Other persons aged 16 or more in household (in addition to couple)			921	(14%)
Remaining	2978	(46%)		
Excluded observations due to:				
Head or spouse full-time student			17	(0%)
Head or spouse is over retirement age[24]			756	(12%)
Remaining	2207	(34%)		
Excluded observations due to:				
Both questionnaire and diary data missing on head or spouse[25]			412	(6%)
Questionnaire data only missing on head or spouse			213	(3%)
Diary data only missing on head or spouse			91	(1%)
Remaining	1491	(23%)		
Excluded observations due to:				
Head or spouse is in employment or self-employment but reports zero hours of paid work on both diary days			321	(5%)
Remaining	1170	(18%)		

[24] Men aged 65 or more and women aged 60 or more are classified as over retirement age.
[25] Diary data is considered missing if the individual completed less than two 24-hour time diaries. Questionnaire data is missing if the individual did not return any part of the individual questionnaire.

Appendix Table A2: QLFS wage equations used to predict wages for the UKTUS sample

Dependent variable is log of gross hourly wage.
Estimation sample is married/cohabiting individuals in (self-defined) full-time work.

	Males		Females	
	OLS	25 percentile	OLS	25 percentile
N	29 187		15 669	
Adj. R^2/Pseudo- R^2	0.3292	0.1910	0.3682	0.2218
Highest qualification (base = none)				
Higher degree	0.85 ***	0.85 ***	0.86 ***	0.87 ***
NVQ Level 5	0.46 ***	0.43 ***	0.68 ***	0.63 ***
First degree	0.76 ***	0.74 ***	0.77 ***	0.75 ***
Other degree	0.81 ***	0.81 ***	0.91 ***	0.90 ***
NVQ Level 4	0.51 ***	0.49 ***	0.47 ***	0.52 ***
Diploma in Higher Education	0.50 ***	0.41 ***	0.62 ***	0.64 ***
HNC, HND, BTEC, etc Higher	0.56 ***	0.57 ***	0.49 ***	0.46 ***
Teaching, Further	0.33 ***	0.35 ***	0.48 ***	0.49 ***
Teaching, Secondary	0.70 ***	0.73 ***	0.81 ***	0.75 ***
Teaching, Primary	0.70 ***	0.86 ***	0.84 ***	0.90 ***
Teaching, Level not specified	0.37 **	0.16	0.34 **	0.29
Nursing etc	0.51 ***	0.57 ***	0.54 ***	0.59 ***
RSA Higher Diploma	0.45 *	0.41	0.41 ***	0.37 ***
Other Higher Education below degree	0.49 ***	0.44 ***	0.44 ***	0.41 ***
NVQ Level 3	0.27 ***	0.27 ***	0.27 ***	0.30 ***
GNVQ Advanced	0.34 ***	0.31 ***	0.29 ***	0.28 ***
A-level or equivalent	0.55 ***	0.47 ***	0.46 ***	0.42 ***
RSA Advanced Diploma	0.25	0.34 *	0.32 ***	0.31 ***
OND, ONC, BTEC etc National	0.45 ***	0.45 ***	0.37 ***	0.36 ***
City and Guilds Advanced Craft	0.26 ***	0.26 ***	0.14 ***	0.13 ***
Scottish CSYS	0.54 ***	0.43 *	0.36 ***	0.22
SCE Higher or equivalent	0.46 ***	0.42 ***	0.40 ***	0.39 ***
AS Level or equivalent	0.30 *	0.29 **	0.36 ***	0.39 ***
Trade apprenticeship	0.21 ***	0.20 ***	0.08 ***	0.11 ***
NVQ Level 2 or equivalent	0.07 ***	0.08 ***	0.08 ***	0.10 ***
GNVQ Intermediate	0.17 *	0.16	0.29 ***	0.23 ***
RSA Diploma	0.36 ***	0.29 *	0.35 ***	0.32 ***
City and Guilds Craft	0.16 ***	0.18 ***	0.23 ***	0.20 ***
BTEC, SCOTVEC 1st/General Diploma	0.32 ***	0.38 ***	0.15 **	0.19 ***
O Level, GCSE A-C or equivalent	0.30 ***	0.24 ***	0.28 ***	0.27 ***
NVQ Level 1 or equivalent	0.06	0.09 *	-0.02	0.01
GNVQ, GSVQ Foundation Level	0.17	0.05	0.27	0.36
CSE < Grade 1, GCSE < C	0.10 ***	0.11 ***	0.08 ***	0.09 ***
BTEC, SCOTVEC 1st/General Certificate	-0.04	0.09	0.18	0.35 ***
SCOTVEC modules	-0.18	-0.27 **	0.09	0.04
RSA other	0.15 **	0.12 *	0.15 ***	0.18 ***
City and Guilds other	0.04	0.10 **	0.06	0.08
YT, YTP Certificate	0.11	0.08 *	-0.05	-0.03

Other qualification	0.09 ***	0.06 ***	0.17 ***	0.10 ***
Don't know	0.20 ***	0.09 **	0.18 ***	0.24 ***
Age	0.08 ***	0.07 ***	0.06 ***	0.05 ***
Age squared	-0.08 ***	-0.07 ***	-0.07 ***	-0.06 ***
Health problem lasting > 1 year	-0.01	-0.01	-0.03 ***	-0.03 ***
Health problem limits activity	-0.02	-0.03 *	-0.03 **	-0.01
Health problem affects amount of work	-0.06 ***	-0.05 **	-0.04 *	-0.05
Health problem affects type of work	-0.07 ***	-0.06 **	-0.02	-0.02
Ethnicity (base = white)				
Black	-0.22 ***	-0.17 ***	-0.10 ***	-0.07 **
Asian (not Chinese)	-0.20 ***	-0.23 ***	-0.11 ***	-0.10 ***
Chinese	-0.23 ***	-0.27	-0.05	-0.05
Other	-0.10 ***	-0.12 ***	-0.05	-0.05
Region (base = London)				
North East	-0.31 ***	-0.25 ***	-0.32 ***	-0.28 ***
North West	-0.26 ***	-0.21 ***	-0.26 ***	-0.22 ***
Yorkshire and Humberside	-0.29 ***	-0.24 ***	-0.32 ***	-0.28 ***
East Midlands	-0.25 ***	-0.18 ***	-0.28 ***	-0.26 ***
West Midlands	-0.23 ***	-0.17 ***	-0.28 ***	-0.23 ***
Eastern	-0.11 ***	-0.09 ***	-0.17 ***	-0.18 ***
South East	-0.09 ***	-0.09 ***	-0.17 ***	-0.15 ***
South West	-0.23 ***	-0.19 ***	-0.30 ***	-0.26 ***
Wales	-0.32 ***	-0.26 ***	-0.33 ***	-0.26 ***
Scotland	-0.27 ***	-0.22 ***	-0.31 ***	-0.26 ***
Northern Ireland	-0.39 ***	-0.33 ***	-0.35 ***	-0.28 ***
# children aged 0-2	0.03 ***	0.03 ***	0.02	0.03 **
# children aged 3-4	0.03 ***	0.02 ***	0.06 ***	0.06 ***
# children aged 5-9	0.02 ***	0.02 ***	0.00	0.00
# children aged 10-15	0.00	0.00	-0.07 ***	-0.06 ***
Month of survey (base = Jan)				
Feb	0.00	0.00	-0.02	-0.01
Mar	0.02	0.02	-0.01	0.00
Apr	0.03 **	0.02	0.00	0.01
May	0.02	0.02	-0.02	-0.01
June	0.03 **	0.02	0.02	0.03
July	0.03 **	0.04 *	0.01	0.02
Aug	0.03 **	0.03	0.01	0.02
Sep	0.03 **	0.02	0.02	0.03
Oct	0.02	0.01	0.05 **	0.06 **
Nov	0.05 ***	0.05 *	0.03	0.02
Dec	0.07 ***	0.05 **	0.05 **	0.05 **
Year dummy 2001 = 1	0.05 ***	0.05 ***	0.06 ***	0.06 ***
Constant	0.37 ***	0.36 ***	0.59 ***	0.56 ***

***, **, and * indicate significance at the 1%, 5% and 10% levels respectively
'25 percentile' refers to quantile regression through the 25th percentile. Standard errors are bootstrapped with 20 repetitions.

Appendix Table A3: Model estimates, by definitions of market and domestic work

	Preferred specification	Excluding travel time	Including secondary time use	Correcting for outliers
Market work: male				
Absolute wage	**9.29** ***	8.44 ***	9.53 ***	9.06 ***
(Absolute wage)^2	**-0.34** ***	-0.31 ***	-0.35 ***	-0.33 ***
Ln(relative wage)	**-0.59**	-0.25	-0.86	-0.90
# Children age 0-2	**-0.79**	-1.05	-0.66	-0.94
# Children age 3-4	**1.87**	1.29	2.06	2.00
# Children age 5-9	**-0.59**	-0.69	-0.65	-0.77
# Children age 10-15	**-1.12**	-1.22	-1.03	-0.92
Age 18-25	**5.69**	4.76	5.78	6.79 **
Age 26-35	**1.38**	1.32	1.44	2.09
Age 46-55	**-2.56**	-2.87	-2.42	-2.66
Age 56+	**-20.27** ***	-19.27 ***	-20.32 ***	-18.55 ***
Constant	**41.32** ***	37.26 ***	42.36 ***	40.19 ***
Market work: female				
Absolute wage	**12.83** ***	12.15 ***	13.17 ***	12.72 ***
(Absolute wage)^2	**-0.58** ***	-0.55 ***	-0.59 ***	-0.57 ***
Ln(relative wage)	**4.75** *	4.61 **	5.86 **	3.84 *
# Children age 0-2	**-18.24** ***	-16.46 ***	-19.50 ***	-16.87 ***
# Children age 3-4	**-12.59** ***	-11.15 ***	-14.23 ***	-12.62 ***
# Children age 5-9	**-6.90** ***	-6.15 ***	-7.09 ***	-6.66 ***
# Children age 10-15	**-0.20**	0.13	0.10	-0.13
Age 18-25	**5.49** *	4.60	6.61 *	5.28 *
Age 26-35	**5.77** ***	5.48 ***	6.70 ***	5.41 ***
Age 46-55	**-3.12**	-2.27	-2.81	-3.19
Age 56+	**-11.28** ***	-9.91 ***	-10.94 ***	-10.99 ***
Constant	**32.19** ***	28.31 ***	32.84 ***	31.88 ***
Domestic work: male				
Absolute wage	**-2.07** ***	-1.80 ***	-1.66 **	-2.04 ***
(Absolute wage)^2	**0.08** ***	0.07 ***	0.07 **	0.08 ***
Ln(relative wage)	**-1.82**	-2.06 *	-2.20	-1.86
# Children age 0-2	**6.47** ***	6.37 ***	7.81 ***	6.32 ***
# Children age 3-4	**0.04**	0.20	1.99	-0.05
# Children age 5-9	**1.84** ***	1.41 **	3.22 ***	1.77 ***
# Children age 10-15	**0.36**	0.14	1.09	0.37
Age 18-25	**-5.38** ***	-5.25 ***	-3.90 *	-5.34 ***
Age 26-35	**-2.38** **	-2.42 **	-2.08 *	-2.38 **
Age 46-55	**1.83**	1.41	0.77	1.78
Age 56+	**6.11** ***	6.04 ***	5.30 ***	5.81 ***
Constant	**17.00** ***	14.84 ***	16.84 ***	17.04 ***
Domestic work: female				
Absolute wage	**-2.59** ***	-2.58 ***	-1.72	-2.44 ***
(Absolute wage)^2	**0.11** **	0.11 **	0.07	0.10 **
Ln(relative wage)	**-6.23** ***	-5.28 ***	-9.60 ***	-5.62 ***
# Children age 0-2	**17.48** ***	16.61 ***	24.85 ***	14.79 ***
# Children age 3-4	**10.25** ***	8.78 ***	16.68 ***	9.93 ***
# Children age 5-9	**7.21** ***	5.49 ***	10.87 ***	6.62 ***
# Children age 10-15	**2.78** ***	2.15 ***	3.35 ***	2.63 ***
Age 18-25	**-3.63** *	-3.18 *	-4.22 *	-3.67 **
Age 26-35	**-3.68** ***	-3.61 ***	-4.60 ***	-3.44 ***
Age 46-55	**2.81** *	3.29 **	1.94	2.50 *
Age 56+	**3.59** *	4.23 **	2.40	3.34 *
Constant	**24.41** ***	21.68 ***	25.61 ***	24.58 ***
$\sigma^2_{L,m}$	**602.24** ***	527.12 ***	620.93 ***	497.04 ***
$\sigma^2_{L,f}$	**648.05** ***	555.60 ***	710.37 ***	596.18 ***
$\sigma^2_{H,m}$	**169.46** ***	140.61 ***	213.01 ***	163.59 ***
$\sigma^2_{H,f}$	**228.16** ***	199.14 ***	387.17 ***	191.13 ***
$\sigma_{L,m,H,m}$	**-177.51** ***	-142.69 ***	-190.91 ***	-155.35 ***
$\sigma_{L,f,H,f}$	**-236.86** ***	-201.30 ***	-305.55 ***	-200.36 ***
$\sigma_{L,m,L,f}$	**109.33** ***	96.20 ***	108.70 ***	101.13 ***
$\sigma_{H,m,H,f}$	**5.84**	10.02 **	12.31	4.09
$\sigma_{L,m,H,f}$	**18.17**	10.24	34.14 **	17.11 *
$\sigma_{L,f,H,m}$	**4.33**	-0.79	11.64	4.47
Log Likelihood	**-17947.74**	-17635.674	-18476.728	-17731.006

Appendix Table A4: Model estimates, by method used to predict wages

	Split sample, 25 percentile	Controls for imputed job tenure	Heckman-corrected	Split sample, new entrant wages	Split sample, 10 percentile
Market work: male					
Absolute wage	**9.29 *****	6.98 ***	8.77 ***	8.34 ***	12.01 ***
(Absolute wage)^2	**-0.34 *****	-0.24 ***	-0.33 ***	-0.29 ***	-0.46 ***
Ln(relative wage)	**-0.59**	-4.38	5.94 **	-1.25	1.25
# Children age 0-2	**-0.79**	-0.98	-0.36	-0.97	-0.76
# Children age 3-4	**1.87**	1.47	2.30	1.87	2.21
# Children age 5-9	**-0.59**	-0.99	-0.31	-0.66	-0.15
# Children age 10-15	**-1.12**	-1.08	-1.33	-1.07	-1.04
Age 18-25	**5.69**	2.18	5.53	4.72	8.18 **
Age 26-35	**1.38**	0.75	1.06	1.22	1.53
Age 46-55	**-2.56**	-3.32	-2.20	-2.62	-1.11
Age 56+	**-20.27 *****	-22.46 ***	-17.98 ***	-20.10 ***	-15.29 ***
Constant	**41.32 *****	44.86 ***	42.51 ***	42.43 ***	36.85 ***
Market work: female					
Absolute wage	**12.83 *****	13.02 ***	8.44 ***	10.93 ***	14.31 ***
(Absolute wage)^2	**-0.58 *****	-0.60 ***	-0.34 ***	-0.47 ***	-0.65 ***
Ln(relative wage)	**4.75 ***	6.77 **	-4.74 **	4.02	2.83
# Children age 0-2	**-18.24 *****	-19.35 ***	-19.88 ***	-20.49 ***	-13.38 ***
# Children age 3-4	**-12.59 *****	-13.70 ***	-12.89 ***	-11.36 ***	-10.75 ***
# Children age 5-9	**-6.90 *****	-7.69 ***	-8.57 ***	-7.80 ***	-4.96 ***
# Children age 10-15	**-0.20**	-1.34	-3.94 ***	-1.26	0.73
Age 18-25	**5.49 ***	4.43	3.08	4.74	5.78 *
Age 26-35	**5.77 *****	5.42 **	5.29 **	5.23 **	5.26 ***
Age 46-55	**-3.12**	-3.54	-5.75 **	-2.46	-1.82
Age 56+	**-11.28 *****	-11.83 ***	-16.00 ***	-9.10 **	-8.43 **
Constant	**32.19 *****	32.69 ***	31.17 ***	32.03 ***	31.32 ***
Domestic work: male					
Absolute wage	**-2.07 *****	-1.29 **	-1.64 ***	-1.50 **	-2.88 ***
(Absolute wage)^2	**0.08 *****	0.05 *	0.07 ***	0.06 **	0.12 ***
Ln(relative wage)	**-1.82**	-1.74	-3.72 ***	-2.08	-1.88 *
# Children age 0-2	**6.47 *****	6.48 ***	6.28 ***	6.32 ***	6.60 ***
# Children age 3-4	**0.04**	0.08	-0.02	0.19	-0.02
# Children age 5-9	**1.84 *****	1.92 ***	1.67 ***	1.84 ***	1.76 ***
# Children age 10-15	**0.36**	0.38	0.25	0.36	0.29
Age 18-25	**-5.38 *****	-4.35 **	-5.14 ***	-4.83 **	-6.17 ***
Age 26-35	**-2.38 ****	-2.20 **	-2.24 **	-2.30 **	-2.47 **
Age 46-55	**1.83**	2.07 *	1.67	1.98 *	1.44
Age 56+	**6.11 *****	6.82 ***	5.42 ***	6.41 ***	4.70 ***
Constant	**17.00 *****	16.16 ***	16.57 ***	16.60 ***	18.15 ***
Domestic work: female					
Absolute wage	**-2.59 *****	-2.01 **	-0.68	-1.72 *	-3.62 ***
(Absolute wage)^2	**0.11 ****	0.09	0.02	0.07	0.16 ***
Ln(relative wage)	**-6.23 *****	-5.28 ***	-2.52 *	-5.24 ***	-6.11 ***
# Children age 0-2	**17.48 *****	17.87 ***	18.14 ***	18.40 ***	15.55 ***
# Children age 3-4	**10.25 *****	10.63 ***	10.47 ***	9.86 ***	9.54 ***
# Children age 5-9	**7.21 *****	7.60 ***	7.97 ***	7.60 ***	6.38 ***
# Children age 10-15	**2.78 *****	3.41 ***	4.15 ***	3.30 ***	2.28 ***
Age 18-25	**-3.63 ***	-2.98	-2.37	-3.17 *	-4.00 **
Age 26-35	**-3.68 *****	-3.54 ***	-3.51 ***	-3.47 ***	-3.53 ***
Age 46-55	**2.81 ***	3.19 **	4.07 ***	2.81 *	2.36 *
Age 56+	**3.59 ***	4.08 **	5.87 ***	3.26	2.73
Constant	**24.41 *****	24.73 ***	25.10 ***	24.69 ***	24.35 ***
$\sigma^2_{L,m}$	**602.24 *****	637.45 ***	587.52 ***	615.07 ***	537.14 ***
$\sigma^2_{L,f}$	**648.05 *****	679.65 ***	730.76 ***	680.96 ***	584.67 ***
$\sigma^2_{H,m}$	**169.46 *****	171.68 ***	168.17 ***	170.70 ***	164.92 ***
$\sigma^2_{H,f}$	**228.16 *****	235.04 ***	239.62 ***	239.62 ***	217.15 ***
$\sigma_{L,m,H,m}$	**-177.51 *****	-187.00 ***	-173.47 ***	-181.99 ***	-160.19 ***
$\sigma_{L,f,H,f}$	**-236.86 *****	-252.01 ***	-269.08 ***	-251.19 ***	-211.33 ***
$\sigma_{L,m,L,f}$	**109.33 *****	120.01 ***	114.48 ***	117.61 ***	87.28 ***

$\sigma_{H,m,H,f}$	**5.84**	5.17	5.32	5.70	6.77
$\sigma_{L,m,H,f}$	**18.17**	20.34 *	15.54	17.49	16.04
$\sigma_{L,f,H,m}$	**4.33**	0.31	5.49	1.16	10.35
Log Likelihood	**-17947.74**	-17998.90	-17983.142	-18015.59	-17827.14

Notes

	Method used to predict gross full-time wages for:	
	Full-time workers	Part-time workers and non-participants
Split sample, 25 percentile (preferred specification)	Conditional mean of sample of full-time workers	Conditional 25th percentile of sample of full-time workers
Controls for imputed job tenure	Conditional mean of sample of full-time workers, controls for work experience, work experience imputed from sample of full-time workers	Conditional mean of sample of full-time workers, controls for work experience, work experience imputed from sample of part-time workers for part-timers, zero for non-participants
Heckman-corrected	Heckman-corrected conditional mean of sample of full-time workers, number and age of children used for identification	Heckman-corrected conditional mean of sample of full-time workers, number and age of children used for identification
Split sample, new entrant wages	Conditional mean of sample of full-time workers	Conditional mean of sample of full-time workers in current job for less than 6 months
Split sample, 10 percentile	Conditional mean of sample of full-time workers	Conditional 10th percentile of sample of full-time workers

***, **, and * indicate significance at the 1%, 5% and 10% levels respectively

Appendix Table A5. Model estimates, sample of two-earner couples with non-missing actual net wages

Wages are not predicted, but are (usual take-home pay/usual hours of work) for UKTUS sample.

(Absolute z-statistics in brackets)

	Market work (weekly hours)				Domestic work (weekly hours)			
	Males		Females		Males		Females	
Absolute wage	-0.34		1.15	*	0.14		-0.41	
	(0.97)		(1.85)		(0.55)		(0.85)	
(Absolute wage)^2	0.01		-0.04	*	0.00		0.02	
	(1.15)		(1.73)		(0.25)		(1.13)	
Ln(relative wage)	0.54		1.58		-1.78		-1.34	
	(0.36)		(1.09)		(1.63)		(1.17)	
# Children age 0-2	-0.79		-8.39	***	7.14	***	12.37	***
	(0.41)		(4.21)		(5.19)		(7.86)	
# Children age 3-4	1.29		-3.37		1.24		6.84	***
	(0.63)		(1.59)		(0.85)		(4.08)	
# Children age 5-9	-0.06		-5.85	***	1.76	**	7.81	***
	(0.06)		(5.06)		(2.18)		(8.56)	
# Children age 10-15	0.09		-0.98		0.91		3.49	***
	(0.10)		(0.98)		(1.33)		(4.41)	
Age 18-25	-5.40		4.25		-1.55		-4.55	**
	(1.63)		(1.49)		(0.66)		(2.03)	
Age 26-35	0.72		2.04		-3.73	***	-1.84	
	(0.43)		(1.18)		(3.10)		(1.36)	
Age 46-55	-0.83		-4.01	*	0.41		5.25	***
	(0.43)		(1.87)		(0.29)		(3.12)	
Age 56+	-2.17		-5.72		1.13		5.51	*
	(0.84)		(1.60)		(0.61)		(1.96)	
Constant	50.39	***	42.15	***	15.57	***	21.46	***
	(33.10)		(25.31)		(14.26)		(16.37)	
$\sigma^2_{L,m}$, $\sigma^2_{L,f}$, $\sigma^2_{H,m}$, $\sigma^2_{H,f}$	232.17	***	248.90	***	120.07	***	155.44	***
	(16.78)		(16.78)		(16.78)		(16.77)	
Implied standard errors	*15.24*		*15.78*		*10.96*		*12.47*	
$\sigma_{L,m,H,m}$, $\sigma_{L,f,H,f}$	-79.92	***	-115.92	***				
	(10.24)		(12.05)					
Implied correlation coefficients	*-0.48*		*-0.59*					
$\sigma_{L,m,L,f}$, $\sigma_{H,m,H,f}$	-1.01		7.55					
	(0.10)		(1.30)					
Implied correlation coefficients	*0.00*		*0.06*					
$\sigma_{L,m,H,f}$, $\sigma_{L,f,H,m}$	18.26	**	13.96	*				
	(2.25)		(1.89)					
Implied correlation coefficients	*0.10*		*0.08*					
Log Likelihood	-8838.1348							
N	563							

Notes

Absolute wage variables are mean-centred around the mean for the sample of men

and women as a whole (£7.34 p.h.). Omitted age group is 36-45. Hence the constant has the interpretation of the mean hours of work for a childless individual age 36-35, with a wage of £7.34 p.h. and a relative wage of 1 (i.e. equal wage to spouse).

Marginal effects in the market work equations relate to the latent variable L^* and so are not directly comparable with marginal effects in the domestic work equations.

***, **, and * indicate significance at the 1%, 5% and 10% levels respectively

Appendix B: Differing assumptions in the prediction of wages

As outlined in Section 3.2, our objective is to predict the expected gross wage rate than an individual could receive in the labour market, were they to seek a full-time job. It is likely that the unobserved characteristics of non-full-time workers (which include past work history) will be associated with lower available potential full-time wages, on average, than the wages of current full-time workers. Here we outline a number of different methods that can be used to tackle the problem of unobserved heterogeneity between full-time and non-full-time workers. The sensitivity of our results to the each method is explored in Section 5.4. As the potential full-time wages of those who choose not to work full-time are essentially unknowable, however, it is difficult to discriminate between the different models on the basis of theory.

Method 1: Split sample, quantile regression

The preferred specification used in this paper is outlined in Section 3.2. We estimate separate predicting equations for full-time and non-full-time workers, where the latter is a quantile regression through the 25^{th} percentile of the full-time wage distribution. We choose the 25^{th} percentile as a relatively conservative estimate of the wage penalty applied to non-full-time workers – one test of robustness is to lower the quantile chosen to the 10^{th} percentile of the full-time wage distribution. Results using this method are labelled "Split sample, 10 percentile" in Tables 6 and 7.

Method 2: Controlling for imputed work experience

An alternative method of tackling the unobserved heterogeneity problem is to use the data in the QLFS on an individual's months of continuous employment[26]. Adding a control for current work history (and its quadratic) to the wage equation estimated on the full-time sample should help to reduce the upward bias on the other coefficients. When predicting the wage for non-participants we plug in the value of zero for months of continuous employment. A problem arises in predicting wages for the UKTUS sample of workers, however, as data on work histories is not provided. We

[26] Months with current employer are also available but are so highly correlated with months of continuous employment that use of this variable adds virtually no information.

use the QLFS data to impute the expected months of continuous employment for current labour market participants on the basis of age, education, number and age of children and health status, denoted collectively by the vector *y*. Separate regressions are run for men and women and for part- and full-time workers, to allow for systematic differences in past labour market behaviour[27]. These imputed work experience variables are then plugged in to obtain a predicted wage, i.e.

$$\ln \hat{w}_{gi} = x_{gi}'\hat{\beta}_{FT,QLFS,g} + \tilde{\tilde{E}}_{gi}\hat{\gamma}_{FT,QLFS,g} + \left(\tilde{\tilde{E}}_{gi}\right)^2 \hat{\gamma}_{FT,QLFS,2,g}$$

where $\hat{\gamma}_{FT,QLFS,g}$ and $\hat{\gamma}_{FT,QLFS,g,2}$ are the coefficients of months of continuous employment from the QLFS full-time workers equation and $\tilde{\tilde{E}}_{gi}$ is imputed work experience, calculated according to:

$$\tilde{\tilde{E}}_{gi} = y_{gi}'\hat{\alpha}_{FT,QLFS,g} \text{ for full-time workers}$$

$$\tilde{\tilde{E}}_{gi} = y_{gi}'\hat{\alpha}_{PT,QLFS,g} \text{ for part-time workers}$$

$$\tilde{\tilde{E}}_{gi} = 0 \text{ for non-participants}$$

The $\hat{\alpha}$'s are estimated by regressing months of continuous work experience on the set of y_{gi} variables, using the relevant sample of QLFS workers.

This method has the advantage that it controls, albeit in a crude way, for the fact that individuals differ in predictable ways in their experience-related human capital. It does not, however, deal with the problem of heterogeneity that is unobserved over and above heterogeneity in months of continuous employment. It seems likely, therefore, that this method will continue to over-estimate the full-time wage available to part-time workers and non-participants.

Method 3: Heckman correction for sample selectivity

The Heckman estimator uses a parametric assumption to deal with the effects on non-random selection into full-time employment. Its drawback is that it requires an exclusion restriction in order for the selection term to be identified. As is common in

[27] Sample sizes for the equations used to impute work experience are: 115 147 full-time men, 5775 part-time men, 52 650 full-time women and 47 854 part-time women (all in couples). Sample sizes are larger than for the wage equations due to the presence of missing data on wages.

the literature, we use number and age of children in the first-stage prediction of whether or not an individual works full-time. A number of authors have expressed dissatisfaction with the assumptions required by the Heckman procedure (e.g. Pencavel, 1998, pp. 784) and it seems likely that this exclusion restriction will not be valid, for women in particular[28].

The prediction method uses the information provided by the Heckman selection term. The expected full-time wage for an individual drawn randomly from the population is given by $E[\ln w_i \mid x_i] = x_i'\hat{\beta}$, i.e. the inverse Mills' ratio (λ_i) is not used in prediction, but is included only to correct for selection bias. Given that we know an individual's employment status, however, we can use this information to improve our estimate of the individual's predicted wage. Specifically, the Heckman formula implies that

$$E[\ln w_{gi} \mid x_{gi}, FT_{gi} = 1] = x_{gi}'\hat{\beta}_{QLFS,g} + \hat{\delta}_{QLFS,g}\hat{\lambda}_{gi}$$

and

$$E[\ln w_{gi} \mid x_{gi}, FT_{gi} = 0] = x_{gi}'\hat{\beta}_{QLFS,g} - \hat{\delta}_{QLFS,g}\hat{\lambda}_{gi}$$

where $\hat{\delta}_{QLFS,g}$ is the coefficient on the selection term and $\hat{\lambda}_{gi}$ is the inverse Mills' ratio calculated by applying the coefficients from the 1st stage QLFS probit equation to the characteristics of individual *i* from the UKTUS sample. Intuitively, we are using the model assumption that the expected value of the error term is higher for individuals with 'positive' unobservables who select into full-time work and lower for individuals with 'negative' observables who do not. In fact, the estimate of $\hat{\delta}_{QLFS,g}$ turns out to be negative in the sample of women, implying that women who self-select into full-time employment command lower wages, on average, than women with the same observable characteristics who work part-time or not at all. This finding contradicts what we would expect on the basis of theory and may reflect misspecification of the underlying parametric assumptions and/or an invalid exclusion restriction. The selection term is of the expected positive sign for men however. Wages predicted using the Heckman procedure, therefore, tend to predict larger gender wage differences amongst full-time workers than other techniques and narrower gender differences amongst part-time workers and non-participants. We

[28] The Heckman estimator uses 85 785 observations on non-full-time working women in addition to the 15 652 full-timers. For men, we have 27 237 censored observations in addition to the 29 158 uncensored observations.

present results using the Heckman technique in Tables 6 and 7 for comparison with other estimates, but urge caution for the reasons outlined above.

Method 4: Split sample, new entrants' wages

An alternative method to predict wages for part-time workers and non-participants is to utilise data on the wages of full-time workers who have only recently started new jobs. Devereux (2004) uses the wages of individuals who worked for only between one and 13 weeks in the last year to impute wages for non-participants. In a similar spirit, we run a QLFS wage equation on full-time workers who have been in their current position for less than six months. (In order to maximise the sample size of this group, we relax the restriction here that our sample consist of individuals in couples, but include a dummy for marital status. Sample sizes are 2438 women and 3591 men.) Predicted wages of part-timers and non-participants are then calculated using these coefficients, whilst the predicted wages of full-time workers are imputed using the same procedure as in Method 1. Again, this procedure is somewhat unsatisfactory as the sample of full-time workers with short job tenure is likely to differ in terms of unobserved human capital from those who have chosen not to work full-time. The method does, however, adjust for the fact that the potential wages of non-full-time workers will reflect their lack of firm-specific human capital.

Appendix C: Simulation of the likelihood for censored cases

We partition the vector of household labour supplies $\mathbf{y}_i^* = \left(\mathbf{y}_i^{U\prime} \quad \mathbf{y}_i^{C*\prime}\right)'$ as outlined in Section 4.2. We can partition the mean vector, error vector and covariance matrix in the same way, i.e.

$$\mathbf{X}_i'\theta = \left(\left(\mathbf{X}_i'\theta\right)^{U\prime} \quad \left(\mathbf{X}_i'\theta\right)^{C\prime}\right)'$$

$$\boldsymbol{\varepsilon}_i = \left(\boldsymbol{\varepsilon}_i^{U\prime} \quad \boldsymbol{\varepsilon}_i^{C\prime}\right)'$$

$$\Sigma = \begin{pmatrix} \Sigma_{UU} & \Sigma_{UC} \\ \Sigma_{CU} & \Sigma_{CC} \end{pmatrix} = \begin{pmatrix} E(\boldsymbol{\varepsilon}_i^U \boldsymbol{\varepsilon}_i^{U\prime}) & E(\boldsymbol{\varepsilon}_i^U \boldsymbol{\varepsilon}_i^{C\prime}) \\ E(\boldsymbol{\varepsilon}_i^C \boldsymbol{\varepsilon}_i^{U\prime}) & E(\boldsymbol{\varepsilon}_i^C \boldsymbol{\varepsilon}_i^{C\prime}) \end{pmatrix}$$

The joint density of $\mathbf{y}_i^*$ can be written as the product of the marginal density of $\mathbf{y}_i^U$, $f_{\mathbf{y}^U}(\mathbf{y}^U)$, and the conditional density of $\mathbf{y}_i^{C*}$ given $\mathbf{y}_i^U$, $f_{\mathbf{y}^{C*}|\mathbf{y}^U}(\mathbf{y}^{C*}|\mathbf{y}^U)$. Using the definitions of normal marginal and conditional distributions, these densities are

$$f_{\mathbf{y}^U}(\mathbf{y}_i^U) = NID((\mathbf{X}_i'\theta)^U, \Sigma_{UU})$$

$$f_{\mathbf{y}^{C*}|\mathbf{y}^U}(\mathbf{y}_i^{C*}|\mathbf{y}_i^U) = NID(\mu_{C.U}, \Sigma_{CC.U})$$

where

$$\mu_{C.U} = \mathbf{X}_i^{C\prime}\theta^C + \Sigma_{CU}\Sigma_{UU}^{-1}\left(\mathbf{y}_i^U - (\mathbf{X}_i'\theta)^U\right)$$

$$\Sigma_{CC.U} = \Sigma_{CC} - \Sigma_{CU}\Sigma_{UU}^{-1}\Sigma_{UC}$$

The likelihood contribution for censored cases is given by

$$L_i = \int_{\{\mathbf{y}_i^{C*}:\mathbf{y}_i^{C*}\le 0\}} f(\mathbf{y}_i^*)d\mathbf{y}_i^{C*} = f_{\mathbf{y}_i^U}(\mathbf{y}_i^U) \times \int_{\{\mathbf{y}_i^{C*}:\mathbf{y}_i^{C*}\le 0\}} f_{\mathbf{y}_i^{C*}|\mathbf{y}_i^U}(\mathbf{y}_i^{C*}|\mathbf{y}_i^U)d\mathbf{y}_i^{C*} \qquad \text{(C1)}$$

The term $f_{\mathbf{y}_i^U}(\mathbf{y}_i^U)$ has a closed form solution, but the presence of the double integral in the expression for the likelihood contribution of no-earner households means that this will not always hold for the second term.

We use a recursive conditioning procedure known as the GHK simulator to evaluate the probability each household contributes to the likelihood[29]. The first step of the

[29] Prowse (2004) employs a GHK estimator in the estimation of individual time allocation decisions to a number of different activities. The model estimated by Prowse treats the unit of observation as the individual, rather than the household, and so does not explore the inter-dependencies of spouses' labour supplies.

procedure transforms the vector $\mathbf{y}_i^{C*}$ into a multivariate standard normal vector, $\mathbf{z}_i$, where

$$\mathbf{z}_i = \mathbf{L}^{-1}\left(\mathbf{y}_i^{C*} - \mu_{C.U}\right) \sim N(\mathbf{0}, \mathrm{I})$$

The matrix $\mathbf{L}$ is derived from the Cholesky decomposition of $\Sigma_{CC.U}$, such that $\Sigma_{CC.U} = \mathbf{L}\mathbf{L}'$.

The integral in (C1) can then be written

$$\int_{\{\mathbf{y}_i^{C*}:\mathbf{y}_i^{C*}\leq 0\}} f_{\mathbf{y}_i^{C*}|\mathbf{y}_i^{U}}(\mathbf{y}_i^{C*} \mid \mathbf{y}_i^{U}) d\mathbf{y}_i^{C*} \equiv \int_{\{\mathbf{z}_i:\mathbf{L}\mathbf{z}_i \leq -\mu_{C.U}\}} f_{\mathbf{Z}|}(\mathbf{z}_i) d\mathbf{z}_i$$

where $f_{\mathbf{Z}|}(\mathbf{z}_i)$ is a standard multivariate normal distribution.

The probability for the no-earner household case is then approximated by the formula

$$\int_{\{\mathbf{z}_i:\mathbf{L}\mathbf{z}_i \leq -\mu_{C.U}\}} f_{\mathbf{Z}|}(\mathbf{z}_i) d\mathbf{z}_i \approx \frac{1}{R}\sum_{r=1}^{R} \Phi\left(\frac{-\mu_{C.U}^1}{\mathbf{L}_{11}}\right) \Phi\left(\frac{-\mu_{C.U}^2 - \mathbf{L}_{12} z_{2,r}}{\mathbf{L}_{22}}\right)$$

where $r = 1,...,R$ indexes the replication; $\mu_{C.U}^1$ and $\mu_{C.U}^2$ are the first and second elements of $\mu_{C.U}$ respectively; $\mathbf{L}_{ij}$ is the (*i*,*j*)th element of $\mathbf{L}$; $z_{2,r}$ is the *r*th draw from a standard normal distribution truncated from above at $\left(\frac{-\mu_{C.U}^1}{\mathbf{L}_{11}}\right)$ and $\Phi(\cdot)$ is the standard normal c.d.f. For properties of the GHK estimator, see Börsh-Saupan and Hajivassiliou (1993).