

## THE EFFECTS OF IN-WORK BENEFIT REFORM IN BRITAIN ON COUPLES: THEORY AND EVIDENCE\*

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This article develops a simple model of household decisions that explicitly accounts for the role played by the Working Families' Tax Credit (WFTC) to examine its effects on couples in Britain. The main implications of the model are tested using panel data from the British Household Panel Survey collected between 1991 and 2002. Overall, the financial incentives of the reform had small and statistically insignificant effects on a wide range of married mothers' decisions. Women's responses, however, were highly heterogeneous, depending on their partners' labour supply and earnings.

In October 1999, the Working Families' Tax Credit (WFTC) replaced Family Credit (FC) with the explicit objective to enhance the work incentives of parents in low-income households. As illustrated in the Introduction of this Symposium, WFTC was more generous than FC in four salient ways: it had higher credits, particularly for children in the age group 0–10, families could earn more before the benefit began to be withdrawn, the taper rate at which earnings above the threshold are taxed was lowered and it offered a large childcare tax credit (Brewer *et al.*, 2009).

Since its introduction, much research has been undertaken to assess whether WFTC was successful or not.<sup>1</sup> Most of the existing studies, however, focus on labour market outcomes and are primarily concerned with single mothers. Much less is known about the credit's impact on married women and men.<sup>2</sup> As pointed out by Blundell and Walker (2001), there is a need to broaden the debate from work incentives to wider questions that are raised by in-work transfer programmes. These include intrahousehold distributional effects, analysis of a greater set of socioeconomic outcomes, inter-temporal incentive effects and the relationship between child outcomes and parental resources. Our article contributes to this debate by taking on some of these issues. In particular, it looks at married couples and how the WFTC reform has affected their intrahousehold allocations, it assesses a broad array of outcomes other than employment and earnings.

If the introduction of WFTC led married women and men to change their labour supply, these changes could have had an effect on a number of other family domains, such as, the time spent with children, the likelihood of having additional children and

\* We are grateful to the British Academy for financial support. We benefited from comments from Richard Blundell, Mike Brewer, Paul Gregg, Jeff Grogger, Hilary Hoynes, Heather Joshi, Steve Machin, one anonymous referee and seminar participants at the 2006 ESPE meetings (Verona), 2006 IFAU/IZA Conference on Labour Market Policy Evaluation (Uppsala), the UK Treasury and University of St Andrews. The views and opinions offered in this article do not necessarily reflect those of the Federal Reserve Bank of New York or the Federal Reserve System as a whole.

<sup>1</sup> The first formal econometric analysis of the effect of the WFTC on labour market behaviour was reported in Blundell *et al.* (2000). For surveys of subsequent analyses, see Blundell (2001) and Blundell and Hoynes (2004). See also Gregg *et al.* (2009).

<sup>2</sup> Throughout the article, the terms 'marriage', 'couples', 'married couples' or 'marital unions' are used in a broad sense to include all types of live-in partnerships, such as cohabitations, stepfamilies and blended families.

the chance of breaking down the partnership. Examination of individuals' responses in such domains is important both because it gives us a more complete picture of the consequences of the 1999 in-work benefit reform and because it allows us to check for the occurrence of unintended effects, which may be crucial for the longer-term success of the reform itself or its future revisions.

We address the issues above by building on earlier papers by Chiappori (1992), Chiappori *et al.* (2002) and Blundell *et al.* (2005) in developing a simple household bargaining model that allows us to analyse multiple individual- and household-level choice decisions and outcomes and how these have changed as a result of the WFTC reform. In particular, the model focuses explicitly on three behavioural responses for women in couples: work incentives (and possible ramifications for the allocation of marital bargaining power), paid childcare utilisation, and divorce decisions. One important implication of the model is that the reform is likely to have generated highly heterogeneous responses, depending on partners' labour supply and earnings. Our empirical analysis therefore is conducted with such results in mind.

This analysis uses longitudinal data drawn from the first twelve waves of the British Household Panel Survey (BHPS) covering the period 1991–2002. Notwithstanding the potential problems of small sample size and attrition that apply to most longitudinal household studies, data from the BHPS are likely to provide us with a better description of the impacts of in-work benefit reform than analyses based on data from repeated cross-sections for at least two reasons. First, the BHPS data contain information on changes in each of the outcomes of interest and thus allow us to focus on a large set of transitions. Following individuals and their families over time is essential here, because it informs us on their precise socioeconomic circumstances both before and after the reform. Second, the BHPS will provide us with nationally representative samples of the population of Britain as it changes over the 1990s and into the twenty-first century.

Our theoretical analysis shows that the work incentives of women whose partners work fewer than 16 hours per week or do not work at all are positively affected by the reform. Conversely, for women whose partners work more than 16 hours per week we predict (depending on the partners' earnings) either ambiguous or negative employment responses. The model also predicts the reform to have ambiguous effects on childcare use but implies an unambiguous increase in in-work credit receipt among married women after the reform. Finally, there might be situations in which couples face a 'marriage penalty', in the sense that their utility gains from the in-work benefit reform are greater if they separate than if they remain married. In such situations, the probability of divorce is expected to rise as a result of WFTC. The theoretical analysis indicates, however, that in other cases the opposite may occur, with the divorce rate falling as a result of the reform.

The empirical results tie in well with the theoretical predictions. In particular, while we find no statistically significant labour supply effects for women married to partners working 16 or more hours per week, we find that the reform led to an increase in eligible employment of 3 percentage points for women whose partners worked less than 16 hours. This was accompanied by a statistically significant increase in the entry rate into eligible employment and a reduction in the exit rate out of eligible employment. Such response estimates represent averages across this group of women whose partners work less than 16 hours and hide considerable variation with household

composition, where mothers of a single pre-school child were found to have increased their eligible employment rate by 5 percentage points, while mothers of multiple older children increased theirs only by 2 percentage points. In addition, the reform had no measurable effect on the labour supply of married men.

The reform also led to a 3 percentage point increase in the probability of receiving the tax credit for married women whose partners worked fewer than 16 hours per week. At the same time, while it did not affect the use of paid childcare for this group of women (who were in fact not eligible for the childcare credit), it led to a 2 percentage point increase (a relative increase of 30%) in paid childcare utilisation by women married to men in eligible employment. Finally, we find evidence that the introduction of the WFTC led to a reduction in the gains from marriage for women in low-income households, with a 2 percentage point increase in the rate at which their marriages dissolved (which represents an almost 160% increase in the divorce rate for these women).

In Section 1 we lay down the theoretical framework within which we interpret our empirical results. After outlining the basic setup, we discuss the main implications for work incentives, divorce and marital bargaining power. Section 2 presents the data used in the empirical analysis and discusses the econometric method and its related identification issues. Section 3 presents our empirical findings and links them back to the theoretical analysis. Section 4 concludes.

## 1. Setup

Our theoretical framework rests on a few simplifying assumptions. First, we formulate a model of a two-person household in which the husband's labour supply is treated as exogenously predetermined. Each household, therefore, is assumed to choose Pareto optimal allocations of consumption and mother's time, taking as given the husband's labour supply and earnings.<sup>3</sup> Second, we ignore all taxes and transfers except those entailed by WFTC. Third, the model ignores unpaid informal childcare that may be available to some mothers. Fourth, the outside option that matters for household bargaining is the 'single state' after divorce rather than a non-cooperative equilibrium within the household. For ease of exposition and space concern, all proofs and mathematical derivations are not presented here, but can be found in Francesconi *et al.* (2007).

### 1.1. Baseline Model

There is a continuum of households. Every household comprises a husband  $h$  and a wife  $w$ , with a fixed number of children. Families' prior formation, fertility and education choices are taken as exogenous. Each married woman has the potential to earn an hourly market wage  $w$ , which is distributed on the interval  $[\underline{w}, \bar{w}]$  according to the cumulative distribution function  $G(w)$ . The variation in earnings opportunities could

<sup>3</sup> While this may appear to be a strong restriction, a large body of empirical evidence, e.g., Heckman (1993) and Eissa and Hoynes (2004), suggests that men's labour supply is insensitive to taxes. We evaluate WFTC's impact on husbands' hours of work later in the paper.

be due to differences in human capital, which are assumed to be exogenous. Men inelastically supply  $l_h$  units of labour and earn a fixed hourly wage given by  $w_h$ . The earnings of married men, denoted by  $m \equiv w_h l_h$ , are thus predetermined. The husband's exogenous labour supply will nonetheless affect the wife's labour supply decision through total family income and eligibility for in-work support.

Each spouse has preferences over own consumption and childcare quality.<sup>4</sup> Formally, let all women be endowed with  $t$  units of time (per week). Let  $l_w$  denote a woman's labour supply (with  $0 \leq l_w \leq t$ ) and  $x_i$  ( $i = h, w$ ) be member  $i$ 's consumption of a private good whose price is set to unity. Preferences of household's member  $i$  are represented by the utility function

$$U_i = \alpha_i \ln(x_i) + \beta_i \underbrace{\ln[\gamma(t - l_w) + \delta l_w]}_{\text{childcare quality}} - \psi_i l_i - \omega_i P, \quad (1)$$

where  $i = w, h$  and  $P$  is an indicator that equals one if a household meets the eligibility criteria for WFTC and chooses to participate in the programme. If a household does not meet the eligibility criteria for the WFTC, or chooses not to participate, then the indicator variable  $P$  takes on the value zero. Men and women may have different preferences over own consumption ( $\alpha_h, \alpha_w$ ), childcare quality ( $\beta_h, \beta_w$ ), disutility of work ( $\psi_h, \psi_w$ ), and potential transaction costs or stigma attached to programme participation ( $\omega_h, \omega_w$ ). Childcare quality is produced according to a technology that is linear in both the amount of time the mother spends with the child ( $t - l_w$ ) and the number of hours the child is looked after by someone else while the mother works ( $l_w$ ). This rules out the possibility that a child is left on his or her own. A family has to pay for childcare at an hourly price  $p_c$  during the time the mother works, while unpaid childcare services provided by friends or relatives are normalised to zero. In (1), we assume that the two inputs to childcare quality are imperfect substitutes, with the quality or marginal productivity in childcare quality of maternal care being  $\gamma$  and the quality of non-maternal care being  $\delta$ .

The model embeds a simple in-work benefit system, which captures the main features of the FC/WFTC programmes. Couples choose the levels of private consumption and female labour supply to maximise (1) subject to the following budget constraint:

$$x_h + x_w + p_c l_w = w l_w + m + B(m, l_w, w, p_c) P, \quad (2)$$

where  $m$  represents the husband's exogenous income and  $B$  denotes the transfers, taxes and subsidies contained in FC/WFTC.<sup>5</sup> The level of in-work support is a function of the household's number and age of children, hours of work and earned income. More precisely, a household with dependent children needs to have at least one adult member working at least  $\underline{l} = 16$  hours per week to be eligible for 'in-work' benefits. Each household is eligible to a maximum amount  $T_{max}$  which increases with the number of children in the household.  $T_{max}$  is payable if total family income is lower than a threshold  $M_{min}$ . Income in excess of this threshold reduces entitlement to the

<sup>4</sup> In another study of this Feature, Grogger and Karoly (2009) present a bargaining model of marriage and divorce in which parents have egoistic preferences that do not depend on child well-being. This different setup will have a number of implications that differ from ours, especially for the analysis of divorce (see subsection 1.3).

<sup>5</sup> For convenience, non-labour income is set to zero.

tax credit by the ‘taper rate’  $\pi$  for every pound of excess income. In addition, the childcare credit element of WFTC subsidises a proportion  $\phi \in (0, 1)$  of the total childcare expenditure  $p_{ctw}$ .<sup>6</sup> The childcare credit is available only if *both* partners work  $\underline{l}$  hours or more per week. With  $M \equiv wl_w + m$  denoting total family income, the basic schedule for the tax credit can be expressed as

$$B = \begin{cases} 0 & \text{if } l_h < \underline{l} \text{ and } l_w < \underline{l} \\ T_{max} - \pi(M - M_{min}) & \text{if } l_h \geq \underline{l} \text{ or } l_w \geq \underline{l}, \text{ and } M < M_{max} \\ T_{max} - \pi(M - M_{min}) + \phi p_c l_w & \text{if } l_h \geq \underline{l} \text{ and } l_w \geq \underline{l}, \text{ and } M < M_{max} \\ 0 & \text{if } M \geq M_{max}, \end{cases} \quad (3)$$

where  $M_{max} = \frac{1}{\pi}[T_{max} + \pi M_{min}]$ . For simplicity, this schedule ignores the cap on the childcare credit component and, with zero non-labour income, the asset test for FC/WFTC eligibility. The assumption we make to solve for the equilibrium household resource allocation is that it is Pareto efficient. One way of doing this is to maximise one member’s utility subject to a given level of the other. It is well known that an equivalent approach is one where each couple solves the following problem (Chiappori *et al.*, 2002; Iyigun and Walsh, 2007):

$$\max_{\{x_h, x_w, l_w, P\}} \Omega \equiv \theta U_w + (1 - \theta) U_h \quad (P1)$$

subject to (2) and (3). The term  $\theta$  is a weighting factor defined over the unit interval, which now is assumed to be constant. Thus, the baseline model corresponds to a unitary framework with weakly separable household preferences. Below we will show that any reform of the policy parameters parameters  $\pi, T_{max}, M_{min}$  and  $\phi$  may also affect  $\theta$  through its influence on the bargaining position of married men and women.

## 1.2. Work Incentives

We examine the WFTC’s effect on married women’s labour supply. We first turn to households in which the husband works less than  $\underline{l}$  hours per week (Household Class A). We then consider households in which the husband works at least  $\underline{l}$  hours (Household Class B). In what follows we define  $\Delta = \gamma - \delta$  and assume that  $\psi_i = \omega_i = 0$  for  $i = h, w$ . Our results regarding the impact of the WFTC reform do not depend on these latter normalisations.

### 1.2.1. Household class A

In this class of households, male partners are assumed to work less than  $\underline{l}$  hours per week. This implies that

- (a) the male partner’s labour supply is below the hours cut-off for WFTC eligibility ( $l_h < \underline{l}$ ), and
- (b) the household is not eligible to the childcare credit element of WFTC ( $\phi = 0$ ).

<sup>6</sup> Under FC, instead, part of the childcare cost could be deducted from earnings in computing benefits. Because this benefit was considerably less generous than the childcare tax credit under WFTC and given that very few women took advantage of the deduction (Blundell and Hoynes, 2004), we ignore it in our analysis.

The household's eligibility status therefore hinges on the wife's labour supply: the household may be ineligible to receive the tax credit either because the woman's labour supply is below the cut-off  $\underline{l}$  or because total family income exceeds  $M_{max}$ .

The following result holds WFTC parameters, preferences and the level of husband earnings constant, and provides a categorisation of the population based on female wage differences.

**RESULT 1.** *A set of in-work benefit parameters, preference parameters and male earnings values exists such that the population of married women can be divided into four groups, according to the wage rate that each partnered woman can earn.*

- (a) *Type-1 women have a wage in the interval  $[\underline{w}, w^*)$ . They either do not work or work fewer than  $\underline{l}$  hours ( $0 \leq l_w^1 < \underline{l}$ ) and hence are ineligible for WFTC.*
- (b) *Type-2 women have a wage in the interval  $[w^*, w^{**})$ . They work exactly  $\underline{l}$  hours ( $l_w^2 = \underline{l}$ ) and receive WFTC.*
- (c) *Type-3 women have a wage in the interval  $[w^{**}, w^{***})$ . They work strictly more than  $\underline{l}$  hours and receive WFTC.*
- (d) *Type-4 women have a wage in the interval  $[w^{***}, \bar{w}]$ . They work more than  $\underline{l}$  hours and either have earnings too high to be eligible for WFTC or choose not to participate.*

*The cutoff wages  $w^*$ ,  $w^{**}$  and  $w^{***}$  (so that  $w^* < w^{**} < w^{***}$ ) are functions of the policy parameters  $\pi$ ,  $T_{max}$  and  $M_{min}$ .*

It is worthwhile emphasising that not all arbitrarily chosen parameter values and husband earnings levels can deliver Result 1. For example, when husband's earnings are sufficiently low, then for some set of preference parameter values women would always work  $\underline{l}$  hours or more in order to be eligible for in-work support (thus, type-1 women would not exist). Conversely, when husband's earnings are too high, the household may be ineligible for the credit (and types 2 and 3 may not exist). As the comparative statics results regarding the WFTC's behavioural impacts are qualitatively the same for these alternative population categorisations, we focus only on situations in which Result 1 holds.<sup>7</sup> This result shows how different women (with different wage rates *ceteris paribus*) determine their labour supply for initial values of the credit base amount  $T_{max}$ , the threshold  $M_{min}$ , and the taper rate  $\pi$ . We use Result 1 to characterise the choices of women who faced WFTC and to compare these to the choices of those who faced the previous FC programme. WFTC increased the generosity of in-work support relative to FC class-A households in three ways: by increasing both  $T_{max}$  and  $M_{min}$  and by reducing  $\pi$ ; Francesconi *et al.* (2007) provide the formal analysis.

*Type-1 women.* For women who chose to work fewer than  $\underline{l}$  hours under FC, the WFTC reform is expected to have a non-negative effect on the probability of working  $\underline{l}$  hours or more per week. This is because the financial benefits associated with working at least

<sup>7</sup> As discussed in Francesconi *et al.* (2007), for some parameter values the optimal labour supply would initially equal  $\underline{l}$  up to some wage level, followed by a drop (instead of increase) in hours worked (types 1 and 2 are switched). However, the qualitative impacts of WFTC on the mother's labour supply and WFTC participation are comparable to those based on Result 1.

$\underline{l}$  hours are greater after the introduction of WFTC. As a result, the indirect utility that can be achieved if the woman works at least  $\underline{l}$  hours goes up. This lowers the cutoff wage  $w^*$ , which, in turn, increases the population-weighted measure of married women working at least  $\underline{l}$  hours. At the same time, the increased generosity of the programme increases its participation rate.

*Type-2 women.* The labour supply of women who worked exactly  $\underline{l}$  hours while receiving in-work support prior to the reform is expected to stay constant or increase. These women do not find it beneficial to reduce their labour supply below  $\underline{l}$ ; in fact, the higher net wage under WFTC (due to the drop in the taper rate) may lead some type-2 women to increase their hours of work (i.e.,  $w^{**}$  may fall). The FC/WFTC participation rate for this group is unaffected.

*Type-3 women.* Women who worked more than  $\underline{l}$  hours while receiving in-work support prior to the reform would not reduce their labour supply below the eligibility cut-off  $\underline{l}$ . However, whether they are induced to increase their labour supply above their pre-reform level or reduce it towards  $\underline{l}$  is less clear. On the one hand, the increases in  $T_{max}$  and  $M_{min}$  raise the benefit amount at their chosen hours of work, generating an income effect that decreases work incentives. On the other hand, the reduction in  $\pi$  produces both a substitution effect and an income effect. The substitution effect follows from the fact that a decrease in  $\pi$  increases the marginal wage rate. This, in turn, increases the opportunity cost of non-market activities, and therefore increases hours of work. The income effect, by contrast, decreases hours of work. While  $w^{***}$  increases as a consequence of the reform, its effect on  $w^{**}$  and on optimal labour supply at any given wage between the two cutoffs for type-3 women is ambiguous, producing an overall ambiguous effect on hours of work. As in the case of type-2 women, the increased generosity of the programme means that its participation rate for this group remains unchanged.

*Type-4 women.* The work incentives of women who worked at least  $\underline{l}$  hours but chose not, or were ineligible, to receive FC *decrease* as a consequence of WFTC. This is driven by the fact that some women who were ineligible for FC at their chosen hours of work now become eligible for WFTC. For other type-4 women, the increased financial advantage from participating in the WFTC programme would induce some of them to reduce their hours worked in order to gain eligibility. The reform leads to an increase in the cut-off wage  $w^{***}$ , which in turn leads to an *increase* in the tax credit recipience rate among this latter group of women. The overall effects therefore are an unambiguous reduction in hours of work and an increase in the programme participation rate.

In sum, for class-A households, the WFTC reform is predicted to increase the proportion of married women working at least  $\underline{l}$  hours and to increase the proportion of households participating in the programme. The overall impact on worked hours, however, is ambiguous. This comprises an increase in hours of work at a lower end of the wage distribution, a negative effect at higher wage rates, and an ambiguous effect for those with wages in between.

### 1.2.2. Household class B

We now consider the work incentives for the group of women whose partners work more than 16 hours per week and therefore satisfy the hours requirement for eligibility to in-work benefit support. In this case, the childcare credit element of WFTC

subsidises a proportion  $\phi \in (0, 1)$  of the incurred childcare costs, provided *both* partners work more than 16 hours per week. If the husband's earnings  $m$  exceed  $M_{max}$  defined in (3), the household would be ineligible for WFTC, irrespective of the wife's hours of work choice. We therefore focus on households where the husband's earnings are sufficiently low to make the household eligible for WFTC receipt at zero hours of work by the wife.

As before, the population of women can be divided into different groups, according to the wage rate that each woman potentially earns. In particular, we have:

**RESULT 2.** *A set of in-work benefit parameters, preference parameters and husband earnings values exists such that the population of married women can be divided into four groups, according to the wage rate that each married woman can potentially earn.*

- (a) *Type-1 women have a wage in the interval  $[\underline{w}, w')$ . They either do not work or work fewer than  $\underline{l}$  hours and receive WFTC but cannot receive its childcare subsidy.*
- (b) *Type-2 and Type-3 women have wages in the intervals  $[w', w'')$  and  $[w'', w''')$ , respectively. They respectively optimally choose to work  $\underline{l}$  hours and more than  $\underline{l}$  hours, and receive both WFTC and its childcare subsidy.*
- (c) *Type-4 women have a wage in the interval  $[w''', \bar{w}]$ . They either have earnings too high to be eligible for WFTC or choose not to participate in the programme.*

*Each of  $w'$ ,  $w''$  and  $w'''$  is a function of the policy parameters  $\pi$ ,  $\phi$ ,  $T_{max}$  and  $M_{min}$ .*

As was the case for class-A households, depending on the chosen parameter values and the level of husband earnings, some of the types described in Result 2 may not exist.

For the sake of brevity, the details of this result are not discussed here. Its main implications are as follows. For women in class-B households in which male earnings are sufficiently low, the reform is predicted to generate ambiguous labour supply responses at the low end of the female wage distribution (types 1 to 3) and negative responses at the top end of the same distribution (type 4). The situation for women married to men with high earnings is comparable to that of type-4 women in class-B households in which male earnings are low. In such households, therefore, WFTC is predicted to reduce or leave female labour supply unaffected and to increase programme participation. The overall labour supply response for married women whose partners work at least 16 hours per week will thus depend on the distribution of husbands' earnings, the distribution of married women's wage rates and the relative magnitudes of their labour supply responses, which in turn depend on the size of the changes in the programme parameters. The total labour supply effect is an empirical issue that will be analysed below.

### 1.2.3. Indirect effects

The results developed so far are based on the assumption that the weights assigned to the preferences of women and men in the household allocation decision are unaffected by the reform. That is, the reform is assumed not to affect the bargaining power of women measured by  $\theta$  in (P1). But if the introduction of WFTC affects the feasible utilities of divorced women (positively or negatively) and if the outside option to marriage is divorce, then the reform might affect couples

*indirectly* by changing the intrahousehold bargaining process so as to reflect the preferences of partnered women either more or less strongly.<sup>8</sup> The introduction of WFTC may have either increased or decreased the marital bargaining power of women measured by  $\theta$  for different subsets of households. In such cases, in addition to the direct effects discussed earlier, we have the following indirect effects on married women's labour supply:

**RESULT 3.** *A change in  $\theta$  induced by WFTC is predicted to affect married women's work incentives as follows:*

- (a) *If the wife places a higher value on an additional hour of her labour supply than her husband does – in the sense that  $\alpha_w/\beta_w > \alpha_h/\beta_h$  – then her labour supply is an increasing function of  $\theta$ .*
- (b) *If the wife places a lower value on an additional hour of her labour supply than her husband does – in the sense that  $\alpha_w/\beta_w < \alpha_h/\beta_h$  – then her labour supply is a decreasing function of  $\theta$ .*
- (c) *If the wife places the same value on an additional hour of her labour supply as her husband does – in the sense that  $\alpha_w/\beta_w = \alpha_h/\beta_h$  – then her hours of work are independent of  $\theta$ .*

This result has a few important implications.<sup>9</sup> Suppose that the reform has led to an increase in the marital bargaining power of women measured by  $\theta$ . Then, if the wife places a lower value on an additional hour of her labour supply than her husband does (Result 3b), then the bargaining power effect operates in such a way to

- (i) mitigate the positive labour supply response at the low end of the wage distribution (class-A households, type-1 women), and
- (ii) magnify the negative labour supply response at the top (class-A and class-B households, type-4 women).

If, on the other hand, the wife places a higher value on an additional hour of her labour supply than her husband does (Result 3a), the bargaining power effect leads to

- (i) a reinforcement of the positive labour supply response at the low end of the female wage distribution, and
- (ii) an offset of the negative labour supply response at the top of the wage distribution.<sup>10</sup>

<sup>8</sup> Ever since the seminal work by Manser and Brown (1980) and McElroy and Horney (1981), divorce has been widely used as threat point in family bargaining models. In contrast, Lundberg and Pollak (1993) propose a 'separate spheres' model that assumes an internal threat point, in which husband and wife behave noncooperatively, and treats divorce as an 'outside option'. See also Mazzocco (2007).

<sup>9</sup> We ought to stress that the ratio  $\alpha_i/\beta_i$  is referred to as the valuation of an additional hour of the wife's labour supply. Strictly speaking,  $\alpha_i$  and  $\beta_i$  relate to preferences over consumption and childcare quality, respectively. But since both consumption and childcare quality are determined by the hours of work chosen by the wife (with consumption monotonically increasing and childcare quality monotonically decreasing in her labour market hours), this interpretation of the  $\alpha_i/\beta_i$  ratio is appropriate.

<sup>10</sup> The intuition behind Result 3c is as follows. If men and women have the same preferences over consumption and childcare quality, then there is no conflict as to how the wife should allocate her time between the labour market and maternal childcare. This, in turn, implies that the time allocation of the wife - and hence the cutoff wages - are independent of the bargaining weight  $\theta$  in that case.

As a special case of the previous analysis, consider households where the male partner is in work and his income  $m$  exceeds the post-reform value of  $M_{max}$ , called  $M_{max}^*$ . In this case the male partner's income is so high that the household will remain ineligible for in-work support even after the reform. However, while not affecting the joint budget set for such couples, the reform may still affect intra-household allocations through a change in the bargaining weight  $\theta$  for these women in marriage. The latter could occur if WFTC affected the utility of these women as divorced single mothers.

### 1.3. Divorce and Marital Bargaining Power

The reform may have had an impact on divorce, because it affected the situation of single parents relative to that of married couples with children (Gregg *et al.* 2009), which could lead to a change in the gains from marriage (Anderberg *et al.* 2008). We explore this possibility with a simple variant of the framework used so far. The utility functions in marriage are those of the baseline model. For marriage to be preferred over divorce, the household allocation has to be incentive compatible, i.e., it must be such that the utility levels of married men and women are at least as high as their reservation utilities outside marriage. For simplicity, but without loss of generality, we assume that the wife receives her reservation utility while married.

Divorce is endogenous and occurs whenever one of the spouses can be made better off by breaking the relationship and the other spouse is not willing or unable to compensate her/him for this potential gain (Weiss and Willis, 1985; Clark, 1999). We assume that either partner can costlessly initiate a divorce, even without the consent of the other. Remarriage is assumed not to be an option. As remarriage is common among Britons, this is a limiting assumption, which could be relaxed in future extensions of our analysis. Notice however that, since remarriage might occur only some time after a partnership breaks down, this no-remarriage assumption can be taken as implying a relatively short time horizon (or low discount rate) for the analysis of the reform effects, which is also consistent with our other assumption of fixed hourly wages (and education levels) of men and women.

We also assume that, after divorce, child custody is assigned to the mother and the mother is the only parent spending time and resources on childcare, even though both parents continue to receive utility from child quality.<sup>11</sup> Let  $a$  be a child support transfer from the father to the mother such that  $0 \leq a \leq m$ . To adhere to the British situation, we take the child support transfer made by the non-custodial father,  $a \in [0, m]$ , to be chosen voluntarily.<sup>12</sup> Finally, let  $\sigma$  be a shock common to the spouses' divorce payoffs, which can be thought of as a measure of the mismatch

<sup>11</sup> In the model of Grogger and Karoly (2009) divorced non-custodial parents do not receive utility from child quality.

<sup>12</sup> In fact, even though all lone mothers on Income Support are compulsory cases of the Child Support Agency (CSA), the vast majority of child support payments in Britain are made informally and, in large part, on a voluntary basis (Blackwell and Dawe, 2003). Although almost one third of the child support payments are made through the CSA and another 15% through a lawyer or a court, monitoring these arrangements is notoriously inadequate and their enforcement is usually very poor (Ermisch and Pronzato, 2008). Preliminary work in which we allow for court-mandated child support orders and (partial or full) compliance by the non-custodial parent suggests that most of the results shown here continue to hold.

of the marriage that disappears on divorce. Thus, each partner's divorce utility is given by

$$D_i = \alpha_i \ln(x_i) + \beta_i \ln[\gamma(t - l_w) + \delta l_w] + \eta_i \ln(\sigma),$$

where  $i = h, w$ . For expositional simplicity, we assume that  $\alpha_i = \beta_i = \eta_i$ . Our aim is to determine the choice of childcare quality by the mother and the transfer from the noncustodial father to the mother, by building upon the work of Del Boca and Flinn (1995) and Flinn (2000), who examined the interactions between divorced parents. It is useful to think of the decision making in the divorce state as proceeding sequentially: given a transfer from the father, the mother decides on consumption and childcare quality. The father uses his knowledge of the mother's choices to decide the size of his transfer.

Define  $\bar{d} = T_{max} + \pi M_{min}$  and  $w = w(1 - \pi) - p_c(1 - \phi)$ . Conditional on the father's transfer, the mother's divorce utility is maximised subject to  $x_w = l_w \bar{w} + \bar{d} + a$  if she meets the eligibility criteria for in-work support, and  $x_w = l_w(w - p_c) + a$  otherwise.<sup>13</sup> Under certain parametric restrictions, divorced women can be divided into four groups (Francesconi *et al.* (2007) provide the details). Specifically:

- (i) those who receive a transfer larger than or equal to  $a^*$  do not work (hence, they are ineligible for WFTC);
- (ii) those who receive a transfer in the interval  $[a^{**}, a^*)$  work exactly  $\underline{l}$  hours (and receive WFTC);
- (iii) those who receive a transfer in the interval  $[a^{***}, a^{**})$  work strictly more than  $\underline{l}$  hours (and receive WFTC); and
- (iv) those who receive a transfer smaller than  $a^{***}$  work strictly more than  $\underline{l}$  hours (and either have earnings too high to be eligible for WFTC or choose not to participate).

Given the mother's labour supply schedule, the husband's problem then is to choose the level of his transfer. He will spend his net income,  $m - a$ , on private consumption,  $x_h$ , while still benefiting from the wife's contributions to childcare quality.

To highlight some of the key aspects of household allocation and divorce decisions, as well as to illustrate the heterogeneity in, and overall ambiguity of, the WFTC's impact on the divorce probability, we highlight two possible equilibrium outcomes with low and high-income husbands. In both cases, it would be optimal for the wife as a divorced single mother to work and to receive a positive tax credit, including its childcare component. The WFTC reform will affect the child support transfer for low and high-income fathers differently. In particular, low-income fathers would optimally choose not to pay any child support and their decisions once divorced would be unaffected by the reform. Instead, higher-income fathers, who would choose to make positive transfers, would reduce their payments in response to the reform. Of course, other

<sup>13</sup> Under the assumption that mothers receive child custody, divorced fathers are ineligible to WFTC because they do not live with dependent children. Both budget constraints are specified assuming full child maintenance disregard so that any child support transfer received does not affect the amount of tax credit received by divorced mothers. This assumption simplifies the algebra considerably. However, based on the figures reported in Ermisch and Pronzato (2008), we expect only a small fraction of divorced (lone) mothers to experience a change in their WFTC eligibility as a result of the child support payment they receive.

equilibria can emerge for households with different characteristics. But the two cases we consider provide an insightful illustration of the heterogeneity in, and overall ambiguous size and sign of, WFTC' impacts on divorce behaviour and the allocation of household bargaining power.

1.3.1. *Case 1: High-income father – couple ineligible as family – mother eligible as single parent – positive child support payment from father to mother*

Before stating our main result, we need to provide some notation. Let  $P_m$  and  $P_d$  denote the utility frontiers relating the husband's and wife's utilities in marriage and divorce, respectively, and let  $U_w^{crit}(\sigma)$  be the utility level of the wife at which  $P_d$  and  $P_m$  intersect (as a function of  $\sigma$ ). Let  $\hat{\sigma}$  be the value of  $\sigma$  such that  $U_w^{crit}(\hat{\sigma})$  equals the wife's utility in divorce. Our key finding can be summarised in the following:

**RESULT 4.** *Consider the case in which the husband's earnings  $m$  exceed the post-reform value of  $M_{max}$ , and in which  $m$ ,  $w$ , and the preference parameters are such that, in divorce, the mother works more than 16 hours per week while receiving a positive tax credit as well as a positive child support transfer from the father. Then:*

- (a) *Divorce occurs if  $\sigma > \hat{\sigma}$ , and marriage survives if  $\sigma < \hat{\sigma}$ .*
- (b) *An increase in the childcare subsidy  $\phi$  and a reduction in the taper rate  $\pi$ , both represented by an increase in  $w$ , raise  $\hat{\sigma}$  and therefore reduce the likelihood of divorce. An increase in the tax credit  $T_{max}$  and an increase in the threshold  $M_{min}$ , both represented by an increase in  $d$ , reduce  $\hat{\sigma}$  and therefore increase the likelihood of divorce.*

This result indicates that the introduction of WFTC does not necessarily lead to a reduction in the gains from marriage and an increase in the incidence of divorce, even if a member of the couple is entitled to receive benefits only if they split. Indeed, if  $\hat{\sigma}$  is affected more by  $\bar{w}$  than by  $\bar{d}$ , then the reform consequences can easily go the other way and work to *increase* the gains from marriage over divorce.

Figure 1a illustrates, using a numerical example. In the pre-reform regime, the divorce outcome is given by the utility pair  $D^{pre}$  on the frontier  $P_d$ . Since  $D^{pre}$  lies within the set of feasible levels of utility that can be achieved through marriage, it follows that marriage Pareto-dominates divorce. Under the assumption that the wife receives her reservation utility, continued marriage leads to the utility pair  $M^{pre}$  on the frontier  $P_m$ , and the gains from marriage over divorce are given by the vertical distance between  $M^{pre}$  and  $D^{pre}$ . Consider now the WFTC's impact on the likelihood of divorce. First, an increase in  $d$  shifts

- (i) the utility frontier in divorce from  $P_d$  to  $P'_d$ , and
- (ii) the divorce outcome from  $D^{pre}$  to  $D'$ .

Both effects lead to an increase in the likelihood of divorce. Indeed, the increase in  $d$  places  $D'$  outside the frontier  $P_m$  and so divorce is preferred to marriage.<sup>14</sup> Second, an increase in  $w$  shifts

<sup>14</sup> Note that the outward movement of the utility frontier in divorce reflects a positive income effect on divorced mothers, which through a decline in the mother's labour supply leads to higher child quality, which also increases the divorced father's utility.

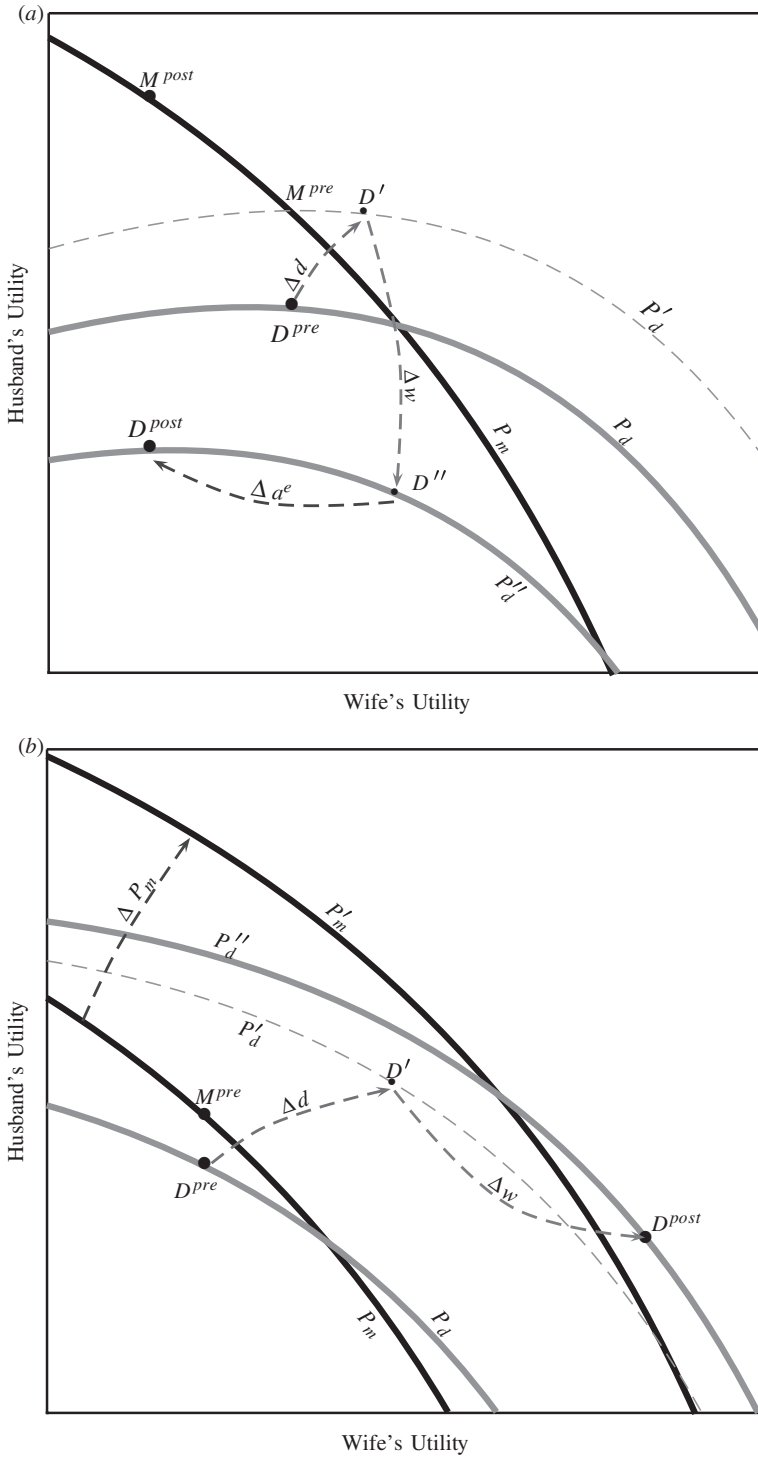


Fig. 1. Divorce and Marital Bargaining Power

- (i) the utility frontier in divorce inwards, from  $P'_d$  to  $P''_d$ , and
- (ii) the divorce outcome from  $D'$  to  $D''$ .

The increase in  $w$  places  $D''$  back inside the frontier  $P_m$ , with the consequence that marriage is preferred over divorce. Thus the increase in  $w$  reduces the likelihood of the divorce.<sup>15</sup> Finally, increments in both  $d$  and  $w$  induce the father to reduce the optimal child support transfer. Therefore, the effect of the reform is to crowd out child support transfers by the father to the mother. Diagrammatically, the optimal reduction in  $a$  shifts the divorce utility pair from  $D''$  to  $D^{post}$ . At  $D^{post}$ , the gains from marriage over divorce are measured by the vertical distance between  $D^{post}$  and  $M^{post}$  on  $P_m$ . It is interesting to note that the gains from marriage are in fact larger in the post-reform regime than in the pre-reform regime. This implies that, in this case, WFTC leads to a decrease in the incidence of divorce. Perhaps surprisingly, in this example, the mother's utilities in divorce as well as in marriage have both declined relative to their pre-reform counterparts, while the outside option of the father has gone down but his utility in marriage has gone up. These changes reflect a shift in bargaining power from the wife to the husband. This is an important and often overlooked finding: a more generous wage subsidy or tax credit for single mothers does not necessarily reduce the gains from marriage, nor does it necessarily lead to an increase in welfare of women when married or even when divorced.

Francesconi *et al.* (2007) analyse the effect of the reform on the distribution of marital bargaining power in this high-income-husband scenario more generally. On the one hand, they show that an increase in the childcare subsidy,  $\phi$ , and a decrease in the taper rate,  $\pi$ , both measured by an increase in  $\bar{w}$ , reduce the wife's divorce utility and therefore decrease her bargaining power,  $\theta$ . On the other hand, an increase in the tax credit,  $T_{max}$  and an increase in the threshold,  $M_{min}$ , both measured by an increase in  $\bar{d}$ , raise the wife's divorce utility and increase her bargaining power. Thus, for women married to high income husbands, it is unclear whether the reform will change the household bargaining process so as to reflect their preferences more strongly.

### 1.3.2. Case 2: Low-income father – couple eligible as family – mother eligible as single parent – no child support payment from father to mother

Analogously to the earlier case, we denote by  $V_w^{crit}(\sigma)$  the utility level of the wife at which the utility frontier relating husband's and wife's utilities in the divorce state intersects the appropriate marriage utility frontier. Let  $\tilde{\sigma}$  be the value of  $\sigma$  such that  $V_w^{crit}(\tilde{\sigma})$  equals the value of the wife's utility in divorce. Thus, we have:

**RESULT 5.** *Consider the case in which the husband works fewer than 16 hours per week with earnings  $m$  sufficiently low such that he optimally pays no child support when divorced. Let the values of  $m$ ,  $w$  and the preference parameters be such that*

<sup>15</sup> The inwards shift of the utility frontier in divorce is due to the public goods nature of child quality. On the one hand, an increase in  $\bar{w}$  leads to an expansion of the mother's budget set and an improvement in her divorce utility. On the other hand, an increase in  $\bar{w}$  also induces the mother to work more, which leads to a reduction in childcare quality and a utility loss of the father. The utility loss faced by the high-income fathers offsets the utility gain of mothers, resulting in an inward shift of the utility frontier.

- (i) in marriage the couples receives a positive tax credit, and
- (ii) in divorce the mother receives a positive tax credit.

Then:

- (a) Divorce occurs if  $\sigma > \bar{\sigma}$  and marriage survives if  $\sigma < \bar{\sigma}$ .
- (b) Keeping utility when divorced fixed, increases in the maximum amount  $T_{max}$  and the threshold  $M_{min}$  and a reduction in the taper rate  $\pi$  decrease the likelihood of divorce through positive effects on the feasible levels of utility obtained in marriage.
- (c) Keeping the utility frontier when married fixed, the reform affects utility in the divorce state, as follows: An increase in the childcare subsidy  $\phi$  and a reduction in the taper rate  $\pi$ , both represented by an increase in  $\bar{w}$ , reduce  $\bar{\sigma}$  and therefore increase the likelihood of divorce. Increases in  $T_{max}$  and  $M_{min}$ , both represented by an increase in  $\bar{d}$ , reduce  $\bar{\sigma}$  and therefore also increase the likelihood of divorce.

This result indicates that the effect of the reform in the divorce state in isolation will generally lead to a greater incidence of divorce but, combined with a positive effect on utility when married, the overall effect on the likelihood of divorce is again ambiguous. Figure 1*b* illustrates. First, an increase in  $d$  shifts the utility frontier in divorce from  $P_d$  to  $P'_d$  and the divorce outcome from  $D^{pre}$  to  $D'$ . Second, an increase in  $w$  shifts the utility frontier in divorce further outwards, from  $P'_d$  to  $P''_d$ , and the divorce outcome from  $D'$  to  $D^{post}$ . Different from the high-income husband case, these effects tend to *increase* the incidence of divorce. Finally, the reform shifts the utility frontier for marriage outwards, from  $P_m$  to  $P'_m$ . The latter shift is the result of an expansion in the budget set. However, despite the positive effects on the feasible utility levels within marriage, the reform has placed  $D^{post}$  outside  $P'_m$ . As a result, there is no marital allocation on  $P'_m$  that makes both parties better off compared to  $D^{post}$ , so at least one party will want to break marriage. Thus, it is quite possible that WFTC led to an increase in the incidence of divorce, even if it left couples with higher joint resources within marriage.

While the overall effects on divorce are ambiguous, it is interesting to note that the childcare subsidy by itself has an unambiguous positive impact on the probability of divorce for married women whose husbands work fewer than 16 hours. Moreover, while higher-income husbands have the additional option to reduce their child support payments in divorce, the main way in which low-income male partners can influence separation is to offer their partners greater access to household resources. For women married to low-income husbands, therefore, the reform can be expected to have changed the household bargaining process so as to reflect the female preferences more strongly.

## 2. Data and Methods

### 2.1. Sample Selection and Descriptive Statistics

The data we use are from the first twelve waves of the British Household Panel Survey (BHPS) collected over the period 1991–2002. Since autumn 1991 the BHPS has annually interviewed a representative sample of about 5,500 households covering more

than 10,000 individuals. All adults and children in the first wave are designated as original sample members. On-going representativeness of the non-immigrant population has been maintained by using a 'following rule' typical of household panel surveys. At the second and subsequent waves, all original sample members are followed (even if they moved house or if their households split up) and there are interviews, at approximately one-year intervals, with all adult members of all households containing either an original sample member, or an individual born to an original sample member whether or not they were members of the original sample. The sample therefore remains broadly representative of the population of Britain as it changes over time.<sup>16</sup>

Our estimation sample includes married and cohabiting couples in which the woman is at least 16 years old and was born after 1946 (thus aged at most 55 in 2002).<sup>17</sup> We exclude those couples where one partner was long-term ill or disabled, or in school full time in a given year. To focus on the segment of the population for whom the reform is more likely to be of potential relevance, we also excluded couples where the man worked 16 or more hours per week *and* earned in the top quartile of the earnings distribution. These earnings far exceeded the income eligibility thresholds for WFTC benefit receipt. The resulting sample includes 3,235 couples, of which 1,430 have dependent children during the sample period and the remaining 1,805 do not have children during the observation period. In line with the Inland Revenue's definition, a child must be aged 16 or less (or be under the age of 19 and in full-time education) to count as a dependent child for whom parents are responsible. Therefore, households with non-dependent children are included in the group of childless couples. Most of our analysis will focus on the mothers. Some 42% of the women have been observed over the whole sample period, and almost 75% of them are observed for at least eight years. The resulting sample size, after pooling all twelve years for women in households with and without dependent children, is 22,146 person-year observations (10,162 on mothers and 11,984 on childless women).

Table 1 presents summary statistics of the labour market outcomes and characteristics of couples by gender and presence of children. The first column presents the statistics for all couples without children, while the second column presents the statistics for all couples with children. There are some noticeable differences in characteristics between the two groups. Male and female partners with children are on average somewhat younger, less educated and more likely to be in social housing. There also appear to be systematic differences in the employment behaviour between the two groups. Compared to married childless women, married mothers are less likely to work 16 or more hours per week (57% versus 84%), as well as 30 or more hours per

<sup>16</sup> Of the individuals interviewed in 1991, 88% were re-interviewed in wave 2 (1992). The wave-on-wave response rates from the third wave onwards have been consistently above 95%. Detailed information on the BHPS can also be obtained at <http://www.iser.essex.ac.uk/ulsc/bhps/doc>. The households from the European Community Household Panel subsample (followed since the seventh wave in 1997), those from the Scotland and Wales booster subsamples (added to the BHPS in the ninth wave) and those from the Northern Ireland booster subsample (which started in wave 11) are excluded from our analysis.

<sup>17</sup> Married couples are not distinguished from cohabiting unions in the analysis below, because we could not detect any relevant difference in terms of outcome responses between these two types of partnerships.

week (30% versus 67%).<sup>18</sup> These differences go in the opposite direction in the case of male partners, with a stronger involvement in the labour market (in terms of either eligible employment or full-time employment) among fathers than among married men without children.

The differences between the two groups of women are mirrored in their labour market transitions: women with children have a lower probability of staying in the labour market, both in eligible employment and full-time work. However, among those not in eligible employment in the previous year, they are more likely to enter eligible employment in a given year. For mothers we also examine further fertility decisions, and entry rates into motherhood for childless women.

Finally we consider a few outcomes that are measured at the household (rather than individual) level. Couples with children are more likely to be in receipt of Income Support and are also more likely to break down their (marital or cohabiting) unions. The other household-level outcomes listed in Table 1 are relevant only for couples with children (i.e., FC/WFTC receipt, and usage of and expenditures on childcare services).

Figure 2 plots the time trends in the rate of eligible employment between 1991 and 2002 for women in the two groups as a whole or distinguished by their partners' employment and earnings position in line with the model presented in Section 1. Similar trends in the rate of female full-time employment have also been examined but are not shown for brevity. Panel (a) shows slightly increasing rates in eligible employment among women with children and, correspondingly, decreasing trends for women without children. Comparable trends emerge in the case of full-time employment rates. Among mothers whose partner does not work or works fewer than 16 hours per week, we observe a greater increase in conjunction with the 1999 reform (panel (b)). To a lesser extent, this can be detected among mothers whose partners work 16 or more hours per week but have earnings in the bottom third of the sample's male earnings distribution (panel (c)). The eligible employment rate for women (whether with or without children) married to men with earnings above the bottom third show relatively stable profiles (panel (d)), with the possible exception of a slight long-term increase in full-time employment for married mothers (not shown). For men (figures not reported), we observe a modest increase in both employment outcomes among fathers and a correspondingly more marked decline among childless married men during the period, with no noticeable changes around the 1999 reform.

These trends suggest that the labour market behaviour of couples overall was not systematically related to the introduction of the WFTC reform, in the sense that we cannot detect a clear-cut change in behaviour among couples who were directly affected by the reform (couples with children) after 1998. Perhaps, the only group of couples who showed labour market movements that were possibly related to the in-work benefit reform are those in which the male partner did not work or worked fewer than 16 hours per week. This evidence is broadly in line with the main predictions of the model presented in Section 1. In the next Section we examine whether the same evidence also emerges from our multivariate regression analysis.

<sup>18</sup> Throughout the article, worked hours are defined by usual weekly hours of work plus usual weekly hours of overtime work.

Table 1  
*Summary Statistics for Married Couples With and Without Children*

	Without children	With children
Household-level outcomes		
FC/WFTC receipt		0.082
Income Support receipt	0.010	0.029
Paid childcare utilisation*		0.149
Weekly childcare costs (2001 pounds)*		45.10 (33.72)
Divorce rates	0.021	0.030
<i>Wife</i>		
Outcomes		
Working 16 or more hours per week	0.835	0.574
Working 30 or more hours per week	0.668	0.300
Persistence probability in:		
Working 16+ per week	0.855	0.728
Working 30+ per week	0.820	0.709
Entry probability in:		
Working 16+ per week	0.068	0.083
Working 30+ per week	0.035	0.030
Birth rates for married mothers		0.037
Entry into motherhood	0.034	
Main explanatory variables		
Age	38.8 (9.3)	35.7 (7.3)
Education:		
No qualification	0.179	0.173
Less than O level/GCSE	0.101	0.139
O level/GCSE (or equivalent)	0.244	0.294
A level (or equivalent)	0.128	0.098
Higher vocational qualification	0.236	0.221
University degree or more	0.112	0.075
Ethnic origin:		
White	0.974	0.954
Black	0.007	0.006
Indian	0.009	0.021
Pakistani/Bangladeshi	0.002	0.010
Chinese or other	0.008	0.009
<i>Husband</i>		
Outcomes		
Working 16 or more hours per week	0.802	0.923
Working 30 or more hours per week	0.716	0.904
Main explanatory variables		
Age	41.3 (9.6)	38.0 (7.9)
Education:		
No qualification	0.178	0.170
Less than O level/GCSE	0.092	0.110
O level/GCSE (or equivalent)	0.206	0.229
A level (or equivalent)	0.146	0.137
Higher vocational qualification	0.275	0.271
University degree or more	0.103	0.083
Ethnic origin:		
White	0.970	0.955
Black	0.008	0.007
Indian	0.009	0.020
Pakistani/Bangladeshi	0.003	0.010
Chinese or other	0.010	0.008
Other (household-level) explanatory variables:		
Number of children by age group: <sup>†</sup>		
0-4		0.506 (0.651)

Table 1  
(Continued)

	Without children	With children
5–10		0.775 (0.858)
11–18		0.456 (0.676)
Housing tenure:		
Owner	0.822	0.759
In social housing	0.077	0.180
In privately rented accommodation	0.101	0.061
Number of women	1,805	1,430
Observations	11,984	10,162

Source. British Household Panel Survey, 1991–2002.

Notes. The statistics in this Table are computed on our sample of all married couples. The sample is restricted to couples where the female partner is aged 55 or less, and whose partner's earnings are below the top quartile in the male (wave-specific) gross monthly earnings distribution. For convenience, the Table does not report summary statistics on region (16 dummies). Standard deviations are in parentheses.

\*Computed over the subsample of couples with children where the youngest child is aged 12 or less.

†Averages are computed over the entire subsample of couples with children. If computed over the three specific subsamples of couples with children in each child group, the averages (standard deviations) are: 1.200 (0.415), 1.453 (0.628) and 1.273 (0.486) respectively.

## 2.2. Econometric Method

We do not estimate our structural model directly, so we do not retrieve the deep parameters which are behind our theoretical results. Rather, we use those results to guide our way of looking at the data and interpreting estimates from our reduced form empirical analysis. This will be based on standard regression models that can be linked to the setup of the previous Section and can also be related to the evaluation literature (Blank, 2002; Hotz and Scholz, 2003) and especially to earlier studies on British couples (Blundell and Hoynes, 2004; Blundell *et al.*, 2004).

Let  $d_i$  denote a dummy variable that is equal to 1 if woman  $i$  is a married mother (treatment group) and 0 if she is married without children (control group), and let  $s$  be the time period in which the reform occurs (i.e.,  $s = 1999$ ). Then, the outcome variable  $y_{it}$  is modelled as

$$y_{it} = a_0 + a_1 d_{it} + (a_{21} + a_{22} d_{it})t + [a_{31} + a_{32}(t - s)]I(t \geq s) + b d_{it} I(t \geq s) + \mathbf{X}'_{it} \boldsymbol{\Gamma} + \varphi_i + u_{it}, \quad (4)$$

where the term  $I(w)$  is a function indicating that the event  $w$  occurs,  $\mathbf{X}'_{it}$  is a vector of individual characteristics,  $\varphi_i$  represents individual fixed effects, and  $u_{it}$  is an i.i.d. error term. Equation (4) allows for different intercepts (when  $a_1 \neq 0$ ) and different linear trends (when  $a_{22} \neq 0$ ) for married individuals without and with children. The parameters  $a_{31}$  and  $a_{32}$  measure possible shifts in the intercept and slope of the process generating  $y$  at the time of the reform. In our case, they capture the effects of all the other (non-WFTC) policy changes that occurred at  $s$  (e.g., the introduction of the minimum wage). With this specification we extend the method developed in Francesconi and van der Klaauw (2007) to married women. As in that study, our key identification assumption is that, other than the introduction of WFTC, there are no

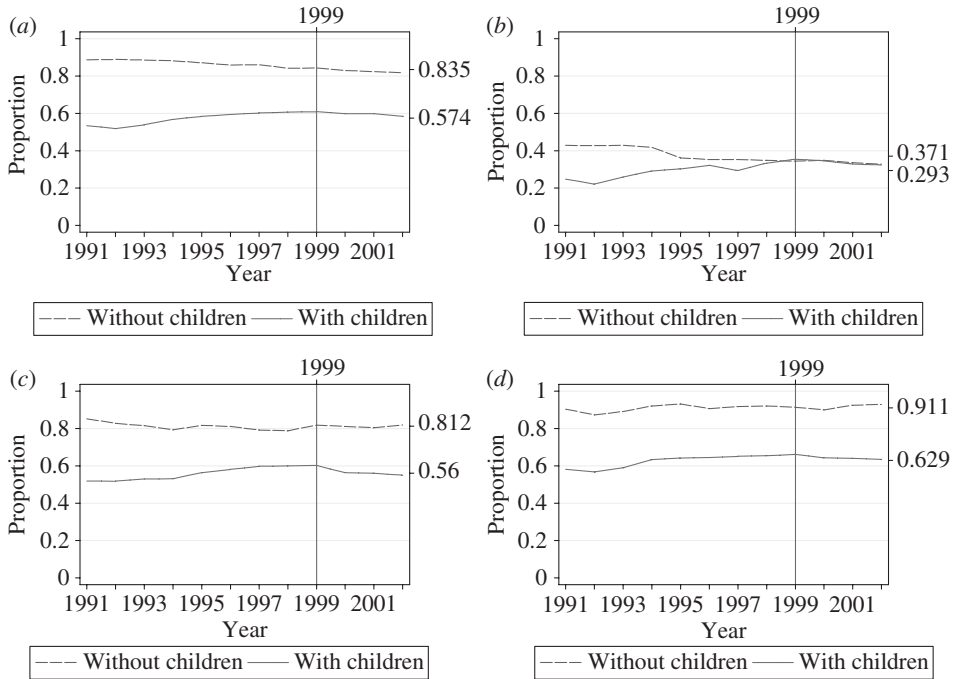


Fig. 2. Working 16 or More Hours Per Week (a) All Married Women (b) Married Women Whose Partners do not Work or Work Fewer than 16 Hours per Week (c) Married Women Whose Partner Works 16+ Hours a Week and has Low Earnings (d) Married Women Whose Partner Works 16+ Hours a Week and has High Earnings Source: British Household Panel Survey, 1991–2002.

Notes. In panel (a), figures are computed on the sample of married couples described in Section 3, with corresponding summary statistics reported in Table 1. In panels (c) and (d), ‘low incomes’ and ‘high incomes’ are respectively defined to be in the bottom third and the top two-thirds in the (wave-specific) monthly male gross earnings distribution for our sample.

contemporaneous shocks that affect the *relative* outcomes of the treatment and control groups.<sup>19</sup>

As a means of controlling for potential differences in group-specific compositional changes over time,  $\mathbf{X}_{it}$  includes a broad set of individual characteristics (such as age, education, region of residence, and number and ages of children). Because married childless women tend to be more concentrated at the bottom and top ends of the age distribution, we account for different age effects by including a quartic polynomial in age. By using panel data, we also account for compositional changes in unobserved characteristics with the inclusion of individual-specific fixed effects, subsumed in  $\varphi_i$ . Unlike studies based on cross-sectional data, this permits us to

<sup>19</sup> As just mentioned here and discussed in Brewer *et al.* (2009), the WFTC reform, however, was accompanied, preceded and followed by the introduction of new programmes (such as the National Minimum Wage and various New Deal schemes) and by changes in key parameters of other existing schemes (such as Income Support). Most of these changes affected married couples equally whether they had children or not (e.g., the minimum wage). But some changes (such as the increase in the child benefit under Income Support for lone mothers working less than 16 hours a week) affected couples with children in the same way as WFTC did. This could lead to a downward bias in our effect estimates. For a related discussion of identification issues, see Blundell *et al.* (2008).

address the possibility that time changes in married-mother status (i.e., being in the treatment group) as well as changes in time-varying individual characteristics are endogenous to the policy reform as long as the fixed effect captures the source of this endogeneity.<sup>20</sup>

Since we use panel data which follow people over time, we can examine whether the introduction of WFTC led to changes in the rate at which married women entered and left the labour force. That is, we can directly assess the impact of WFTC on year-to-year employment transitions. This is important in relation to some of our theoretical predictions. It also helps us to understand whether any given WFTC effect is associated with a change in the rate at which married women entered the labour force and/or with a change in the rate at which people left it. We implement this analysis by estimating separate outcome equations (3) for each value of  $y_{i,t-1}$ .

### 3. Empirical Evidence

#### 3.1. Basic Estimates for the Labour Market Outcomes of Married Women

Table 2(a) presents the estimates for our key labour market outcomes, that is, eligible employment and full-time employment for the whole sample of married women. These estimates are obtained from models that do not condition on partner's labour supply and earnings. For simplicity of interpretation, we only report least squares estimates based on linear probability models with fixed effects. Marginal effects estimates from Chamberlain fixed-effects logit models were very similar and thus not reported. The first column of the Table shows treatment effect estimates with group-specific pre-programme linear trends (as in (4)).<sup>21</sup> The estimates imply that married mothers overall increased their full-time employment rates by about 1.7 percentage points, and their likelihood of working 16 or more hours per week by 0.7 percentage points. Neither of these two estimates are statistically significant. These results, which are also robust to the introduction of group-specific quadratic trends, are close to those reported in Blundell *et al.* (2000) and Blundell and Hoynes (2004). Importantly, they are consistent with the general predictions of our analysis in Section 1, where we emphasised that the introduction of WFTC might have led to ambiguous overall employment effects for married women.

#### 3.2. Heterogeneity in Responses and Robustness Analysis

Section 1 suggests that the labour supply responses of women in couples is highly heterogeneous depending on the employment status and earnings of their partners (Results 1 and 2). We therefore re-estimated the previous models after stratifying

<sup>20</sup> In the next Section, we perform an additional sensitivity check to address the potential endogeneity of changes in the composition of the treatment and control groups.

<sup>21</sup> We also experimented with group-specific pre-programme quadratic trends and found estimates almost identical to those reported in the Table. These estimates therefore are not shown. We also looked at year-specific treatment effects and, in line with Blundell and Hoynes (2004) and Francesconi and van der Klaauw (2007) found evidence of an introduction effect, with stronger responses immediately after the reform. Again, for space limitation, these estimates are not reported.

Table 2

*The WFTC Effect on Married Women's Employment, Overall and by Woman's Education, Fixed Effects Estimates*

Type of sample, outcome, and estimation	All households	Partner does not work or works fewer than 16 hours a week	Partner works 16+ hours a week with low earnings	Partner works 16+ hours a week with high earnings
<i>(a) Total sample</i>				
Working 16+ hours a week	0.007 (0.012)	<i>0.031</i> (0.014)	0.006 (0.017)	0.001 (0.011)
Working 30+ hours a week	0.017 (0.010)	0.019 (0.018)	0.023 (0.020)	0.012 (0.014)
Observations	22,146	4,994	5,982	11,170
<i>(b) Low education sample</i>				
Working 16+ hours a week	0.008 (0.009)	<i>0.033</i> (0.014)	0.007 (0.018)	0.001 (0.016)
Working 30+ hours a week	<i>0.020</i> (0.010)	0.021 (0.018)	0.025 (0.023)	0.015 (0.019)
Observations	12,438	3,016	3,140	6,282
<i>(c) High education sample</i>				
Working 16+ hours a week	0.006 (0.012)	<i>0.028</i> (0.013)	0.006 (0.020)	0.001 (0.018)
Working 30+ hours a week	0.014 (0.022)	0.016 (0.021)	0.020 (0.034)	0.009 (0.015)
Observations	9,708	1,978	2,842	4,888

*Notes.* Standard errors are shown in parentheses. Estimates are obtained from fixed-effects linear probability models on the sample of married women without children and married women with children, which include group-specific linear trends. Estimated coefficients in italics are statistically different from zero at the 5% significance level. The other variables included in each regression pertain to the wife. They are a quartic polynomial in age, number of children by age group of the youngest child (6 groups: one child aged 0–4, one child aged 5–10, one child aged 11–18; two or more children with the youngest aged 0–4, two or more children with the youngest aged 5–10, two or more children with the youngest aged 11–18), dummy variables for ethnic origin (4 dummies; white is the base category), highest educational qualification (5; no qualification), housing tenure (2; owner) region of residence (16; Greater London); and interactions between age and number of children by age group, age and the educational group dummies, and education and number of children by age group. *N* is the number of person-wave observations. Low (high) partner's earnings are defined as those in the bottom one third (top two-thirds) in the (wave-specific) monthly male gross earnings distribution for our sample. In panels (b) and (c), the education groups of women are defined as being 'low' if the woman has O level/GCSE or lower qualification, and 'high' if she has A level or higher qualification.

the sample of women by partner's labour supply and earnings. In particular, we distinguish three groups: women whose partners do not work or work fewer than 16 hours per week; women whose partners work 16 or more hours per week and have earnings in the bottom third of the sample male earnings distribution; and women whose partners work 16 or more hours per week and have earnings in the top two-third of the male earnings distribution.<sup>22</sup> With the first group we try to identify women in class-A households without attempting to discriminate between different types of women. The other two groups intend to isolate class-B households, and the distinction between low-earning and high-earning husbands is meant to separate type-4 women from the other three types. This categorisation captures the

<sup>22</sup> Recall that households with male partners working 16 or more hours per week and earnings in the top quartile of the original distribution of labour income have been dropped from this analysis. The categorisations mentioned in the text, therefore, are conditional on such a sample selection.

heterogeneity implied by the model only imperfectly but it has the advantage of being fairly parsimonious. In some of the analysis below, however, we shall apply finer categorisations, especially when this is more strongly entailed by our theoretical predictions.<sup>23</sup>

The results are shown in columns two to four in Table 2 (*a*). We find strong eligible employment effects among mothers with a partner who did not work or worked fewer than 16 hours per week (column two). These women increased the probability of working 16 or more hours per week by 3 percentage points, while increasing the full-time employment rate by 2 percentage points. Interestingly, these results are close to those found for single mothers (Francesconi and van der Klaauw, 2007; Gregg *et al.*, 2009). They are also consistent with our predictions in Section 1, where we showed that women married to low-income men generally had a greater incentive to work or increase their hours worked following the reform. Our theoretical analysis implies further response heterogeneities which will be considered in greater detail below when we differentiate by the number and ages of children.

For women whose partners work 16 or more hours per week we find instead no statistically significant labour supply response regardless of the man's position in the earnings distribution (third and fourth columns). The estimates in column 4 can be seen as applying to women who are closer to what we referred to as type 4 in Section 1. According to our model and the comparative statics results for class-A and class-B households, in absence of a change in bargaining power, such women would have either not responded to the reform (if their partner's earnings were relatively high), or experienced a *negative* labour supply effect (if household earnings were not far above the income eligibility threshold). This negative response could be offset by an increase in bargaining power as long as the wife has a higher valuation on an additional hour of her labour supply than her husband does (Result 3*b*). But the small magnitude of the response and the lack of its statistical significance point to a relatively modest role played by intrahousehold bargaining power.

Another dimension over which we may expect heterogeneous responses is women's education, even though this is not explicitly examined in Section 1. This heterogeneity may come about because educational levels could be correlated not only with wage rates but also with female labour market attachment and husband's characteristics through assortative mating (and this, in turn, may place women in different segments of the male earnings and hours distributions). Table 2(*b,c*) reports fixed-effects estimates obtained from the subsample limited to women with educational qualifications below A level ('low education sample') and with A level or higher qualification ('high education sample') respectively. The effects are slightly larger for women in the

<sup>23</sup> As compared to the other two groups of women, those whose partners work fewer than 16 hours per week or do not work at all are somewhat older, less educated, more likely to be nonwhite and in social housing, much less likely to work at any margin, and more likely to receive either WFTC or IS. Women whose partners work 16 or more hours per week are similar in terms of most of the observables used in our analysis, regardless of the partner's position in the earnings distribution. Those married to low-earning partners are slightly more likely to work (especially 16 or more hours per week), slightly less likely to divorce and have marginally more children than their counterparts with high-earning husbands. In our estimation sample, class-A households constitute 23% of the sample and low and high-earning class-B households representing, respectively 27% and 50% of the total sample.

low-education sample but the differences in impact with respect to the women in the other sample are never statistically significant. Besides small sample size considerations, this result suggests that differential responses along the educational gradient are likely to be limited. This echoes some of the results for single mothers presented in Francesconi and van der Klaauw (2007).

A further robustness check pertains to sample composition issues. The estimation strategy outlined in Section 2 relies on a conditional independence assumption that requires assignment to treatment be random, conditional on a set of characteristics and conditional on individual fixed effects. It is conceivable that the introduction of WFTC might have differential impacts on the entry and exit rates for the treatment and the control groups, leading to changes in sample composition of both groups that are not captured by the observables or fixed effects. Although Francesconi and van der Klaauw (2007) find little evidence of this compositional problem among single women, some of our results below suggest that it could be relevant for specific subgroups of married women. We therefore re-classified treatment and control groups using only pre-1999 characteristics, including children, marital status and husbands' labour supply and earnings. The resulting sample sizes are marginally smaller than those reported in Table 2. But none of the effect estimates shown in that Table is altered by the different selection criteria. Thus, women whose partners do not work or work fewer than 16 hours per week are the ones experiencing the largest significant increase in the probability of being in eligible employment. Women in the other two groups instead do not show any significant change in labour market behaviour. Likewise, and as before, the full employment margin does not seem to be affected.

### 3.3. Labour Market Outcome Estimates by Child's Age

As mentioned in the Introduction to this Symposium, the increase in the base amount of the tax credit implied by the WFTC reform was greatest for parents of younger children (Brewer *et al.*, 2009). By eliminating the differential treatment that Family Credit had on children of different ages (achieved via a larger credit increase in favour of younger children) and by providing more generous support to childcare costs, the WFTC reform could have generated different labour market responses depending on the number and ages of children.<sup>24</sup> To analyse this possibility, we estimate separate treatment effects by the number of dependent children, distinguishing by age of the youngest child using the age intervals 0–4, 5–10, and 11–18.<sup>25</sup> The fixed-effects estimates of this analysis for all women (first column) and for the three groups of

<sup>24</sup> This indeed has been the case for single mothers; see Blundell *et al.*, (2004) and Francesconi and van der Klaauw (2007).

<sup>25</sup> In particular, the specifications we analyse take the following form:

$$y_{it} = a_0 + a_1 d_{it} + (a_{21} + a_{22} d_{it})t + [a_{31} + a_{32}(t-s)]I(t \geq s) + \sum_{j=1}^6 b_j d_{it} N_{ijt} I(t \geq s) + \mathbf{X}'_{it} \Gamma + \varphi_i + u_{it},$$

where  $N_{ijt}$  is a dummy variable that equals one if woman  $i$  at time  $t$  has her youngest child in group  $j$ , and  $j = 1, \dots, 6$  distinguishes mothers of one child from mothers of two or more children with the only child or the youngest child being aged 0–4, or 5–10, or 11–18.

Table 3

*The WFTC Effect on Married Women's Labour Supply by Age and Number of Children and Partner's Employment Status and Earnings All Sample, Fixed Effects Estimates*

Outcome and age and number of children	All households	Partner does not work or works fewer than 16 hours a week	Partner works 16+ hours a week with low earnings	Partner works 16+ hours a week with high earnings
<i>(a) Working 16+ hours a week</i>				
One child aged 0–4	0.012 (0.024)	<i>0.048</i> (0.021)	0.007 (0.039)	0.001 (0.030)
One child aged 5–10	0.007 (0.021)	<i>0.044</i> (0.020)	0.002 (0.048)	0.001 (0.032)
One child aged 11–18	0.003 (0.018)	0.017 (0.028)	0.001 (0.024)	–0.002 (0.023)
Two children or more, youngest 0–4	0.010 (0.022)	<i>0.036</i> (0.017)	0.014 (0.036)	–0.002 (0.026)
Two children or more, youngest 5–10	0.005 (0.020)	0.016 (0.042)	0.001 (0.049)	0.003 (0.020)
Two children or more, youngest 11–18	0.003 (0.019)	0.019 (0.034)	0.002 (0.027)	0.003 (0.024)
<i>(b) Working 30+ hours a week</i>				
One child aged 0–4	<i>0.024</i> (0.012)	0.027 (0.033)	0.023 (0.058)	0.019 (0.020)
One child aged 5–10	0.019 (0.021)	0.023 (0.040)	0.024 (0.035)	0.016 (0.018)
One child aged 11–18	0.012 (0.018)	0.015 (0.026)	0.023 (0.046)	0.009 (0.027)
Two children or more, youngest 0–4	0.019 (0.022)	0.024 (0.036)	0.027 (0.063)	0.013 (0.019)
Two children or more, youngest 5–10	0.014 (0.017)	0.012 (0.025)	0.026 (0.034)	0.010 (0.021)
Two children or more, youngest 11–18	0.009 (0.025)	0.012 (0.038)	0.018 (0.041)	0.005 (0.020)
<i>N</i>	22,146	4,994	5,982	11,170

*Notes.* Standard errors are shown in parentheses. Estimates are obtained from fixed effects linear probability models on the sample of married women without children and married women with children, which include group-specific linear trends. Estimated coefficients in italics are statistically different from zero at the 5% significance level. The other variables included in each regression pertain to the wife. They are listed in the note to Table 2. *N* is the number of person-wave observations. Low (high) partner's earnings are defined as those in the bottom one third (top two-thirds) in the (wave-specific) monthly male gross earnings distribution for our sample.

women stratified according to their partners' labour supply and earnings (the remaining three columns) are shown in Table 3.

Looking at the whole sample of women, we cannot detect differential labour supply responses across mothers with children in different age groups or with a different number of children. The results in the next three columns of Table 3, however, indicate that the reform led to a statistically significant 4.8 percentage point increase in eligible employment among women with a partner who did not work or worked fewer than 16 hours per week and with one pre-school aged child. Mothers with one child aged 5–10 also increased their probability of working 16 or more hours per week by 4.4 percentage points, while mothers with two pre-school children increased the probability of eligible employment by 3.6 percentage points. There is instead little evidence

of an increase in eligible employment of mothers with multiple older children. These results tie in well with those found for single mothers by Francesconi and van der Klaauw (2007). There is little variation in the labour supply responses by child's age and number of children of mothers with partners who work more than 16 hours per week, regardless of their position in the male earnings distribution. Again, the lack of a meaningful and significant effect among these women suggests that the reform had at most a relatively modest impact on women's bargaining power.

Finally, a comparison of the full-time employment effects with the eligible employment effects is quite revealing. Relative to the eligible employment estimates, the full-time employment estimates are always smaller for women whose partner works fewer than 16 hours per week. They are, however, larger for women whose partner works 16 or more hours (irrespective of his earnings); even though such responses are never statistically significant, they are invariably positive and range between 1 and 3 percentage point increases. The comparative statics results following Results 1 and 2 in Section 2 suggest that type-4 women (presumably better identified by women whose partner works 16 or more hours per week and has high earnings) should either have not altered or reduced their labour supply in response to the introduction of WFTC. But, as indicated in Result 3*b*, the reform could have generated changes in marital bargaining power that would have offset the negative labour supply response at the top of the wage distribution. Therefore, the greater full-time employment effects among women with high-earning partners (although not statistically significant) is consistent with a (modest) reform-induced change in bargaining power.

In summary, our estimates imply a strong positive effect on eligible employment and a smaller positive and statistically insignificant effect on full-time employment, for women who are likely to be in class-A households. Both findings are consistent with our comparative statics results in Section 1. The results for class B households are similarly consistent with an overall ambiguous labour supply effect of WFTC, as predicted by our theoretical model.

### 3.4. *Employment Transitions*

Because we use panel data, we can examine whether the introduction of WFTC led to changes in the rate at which married women entered and left the labour force. That is, we can directly assess the impact of WFTC on year-to-year employment transitions. For this purpose, we estimate the WFTC effect both on the probability of staying in any of the two labour market states analysed so far and on the probability of starting a job with 16 or more hours of work per week, or a full-time job. We label the former set of probabilities as persistence probabilities and the latter as entry probabilities. The corresponding treatment effect estimates are shown in Table 4, in which we report estimates for the whole sample of women (first column) and for the three groups of women distinguished by their husbands' labour supply and earnings (second to fourth columns).

For the entire sample, we cannot find any significant impact of the WFTC reform on persistence probabilities in the two labour market states, nor can we detect any impact on entry probabilities. But as expected from our theoretical analysis as well as the previously reported empirical results, there is some sizable heterogeneity across women

Table 4  
*The WFTC Effect on Married Women's Labour Supply Transitions All Sample*

Outcome	All households	Partner does not work or works fewer than 16 hours a week	Partner works 16+ hours a week with low earnings	Partner works 16+ hours a week with high earnings
<i>(a) Persistence probability*</i>				
Working 16+ hours a week	0.008 (0.013)	<i>0.039</i> (0.017)	0.008 (0.026)	0.002 (0.009)
<i>N</i>	10,959	1,306	2,944	6,709
Working 30+ hours a week	0.014 (0.022)	0.028 (0.012)	0.013 (0.039)	0.011 (0.026)
<i>N</i>	7,144	781	1,925	4,438
<i>(b) Entry probability†</i>				
Working 16+ hours a week	0.013 (0.018)	<i>0.022</i> (0.010)	0.003 (0.037)	0.010 (0.033)
<i>N</i>	7,039	2,924	1,702	2,403
Working 30+ hours a week	0.010 (0.012)	<i>0.018</i> (0.009)	0.006 (0.023)	0.007 (0.019)
<i>N</i>	10,838	3,492	2,631	4,715

*Notes.* Standard errors are shown in parentheses. Estimates are obtained from linear probability models of transition in labour market states on the sample of married women without children and married women with children, which include group-specific linear trends. Estimates are from the specification with a constant post-reform effect. Estimated coefficients in italics are statistically different from zero at the 5% significance level. The other variables included in each regression pertain to the wife. They are listed in the note to Table 2. *N* denotes the number of wave-on-wave state-specific transitions.

\*Conditional on working (16+ hours a week, or 30+ hours a week) in the year prior to that which the outcomes refer to.

†Conditional on *not* working (16+ hours a week, or 30+ hours a week) in the year prior to that which the outcomes refer to.

depending on their husbands' employment status and earnings. In particular, the introduction of the in-work benefit reform increased mothers' persistence rates in eligible employment and full-time employment by 4 and 3 percentage points respectively if their partners did not work or worked fewer than 16 hours per week. Entry rates for the same group of women show slightly lower but similarly important and statistically significant increases along both labour market margins. Such findings line up nicely with the theoretical predictions for class-A households. But the labour market transitions for mothers with husbands working 16 or more hours per week do not significantly differ from the transition of comparable married women without children. This does not contradict our theoretical predictions (see the comparative statics results for class-A households in Section 1). In general, therefore, estimates of the reform's impact on employment transitions are coherently tied with those found earlier for employment levels. It is also worth emphasising that the overall pattern of the results for women with husbands working fewer than 16 hours echoes that found for lone mothers (Francesconi and van der Klaauw, 2007). The fact that the overall labour supply response among lone mothers was somewhat larger, especially so among those with pre-school children, can be explained by the fact that lone mothers were also potentially eligible for the more generous child care credit, while women married to men working fewer than 16 hours per week are instead ineligible for this credit.

Table 5

*The WFTC Effect on Married Men's Labour Supply All Sample, Fixed Effects Estimates*

Outcome	All households	Partner does not work or works fewer than 16 hours a week	Partner works 16+ hours a week with low earnings	Partner works 16+ hours a week with high earnings
Working 16+ hours a week	0.003 (0.009)	0.005 (0.016)	0.014 (0.021)	0.001 (0.010)
Working 30+ hours a week	0.004 (0.010)	0.006 (0.013)	0.005 (0.032)	0.002 (0.012)
<i>N</i>	22,146	8,460	1,842	11,844

*Notes.* Standard errors are shown in parentheses. Estimates are obtained from fixed effects linear probability models on the sample of married men without children and married men with children, which include group-specific linear trends. Estimates are from the specification with a constant post-reform effect. The other variables included in each regression are listed in the note to Table 2 but they pertain to the husband. *N* is the number of person-wave observations.

### 3.5. Labour Market Outcomes of Married Men

For simplicity, our model takes husbands' labour supply and earnings as given. Despite this, we analysed male labour supply responses to WFTC in a similar fashion to what we have done so far for women.

Table 5 displays the fixed-effects estimates of the WFTC effect on men's labour market outcomes. For the whole sample, there is no evidence of an effect of the in-work benefit reform on men's behaviour. This emerges also after distinguishing men on the basis of their female partners' labour supply and earnings. We also analysed labour market transitions and again found no measurable significant effect (for brevity, these estimates are not shown). Thus, the WFTC programme seems to have had no impact on married men, suggesting that our assumption on the exogeneity of husband's labour market behaviour to the in-work benefit reform is credible.<sup>26</sup>

In this analysis, however, men were stratified on the basis of their partners' labour supply and earnings observed over the whole sample period (both before and after the reform). But our earlier estimates showed that married women's labour supply changed substantially across the male hours/earnings distribution as a result of the WFTC reform. Consequently, the composition of the male groups (that is, the samples used for the three last columns of Table 5) might have changed quite substantially too, around the 1999 reform date. As an additional sensitivity check, therefore, we repeated what we did earlier in subsection 3.2 but the other way around. In particular, we re-estimated the same regressions reported in Table 5 with the difference that men were now distinguished on the basis of their wives' labour supply and earnings observed only in the years that preceded the reform (1991–98). With similar point estimates and slightly larger standard errors in all groups and outcomes, the results (not shown) confirm those of Table 5.

<sup>26</sup> Blundell *et al.* (2004) report an overall negative effect on labour force participation for men. This effect seems to be driven by the effect on men whose partners were working. However, that result turns out to be not robust to a number of sensitivity tests.

### 3.6. *Divorce and Other Outcomes*

The introduction of WFTC might have affected married women's (and their families') behaviour in domains other than labour supply. As explained in Section 2, WFTC may have had an impact on people's decisions about whether to dissolve their marriage. A couple would face a marriage penalty if the utility gains from the reform were lower within marriage than after divorce. As compared to the large body of research on the effect of welfare reforms on non-labour-market outcomes in the US (e.g., Blank (2002), Hotz and Scholz (2003), Bitler *et al.* (2002) and references therein), this literature is virtually non-existent for Britain.<sup>27</sup>

The first row of Table 6 shows estimates of the reform's impact on divorce. There is no evidence of an increase in the divorce rate as a consequence of the in-work benefit reform for the whole sample of married mothers, nor is there evidence that it affected the divorce rate of women married to partners in eligible employment. But women married to a partner who does not work or works fewer than 16 hours per week were more than 2 percentage points more likely to dissolve their partnership after the reform than their childless counterparts. This is a substantial impact on the divorce rate, representing an increase of almost 160% with respect to the pre-reform period. This result implies that for such women, the introduction of WFTC reduced the gains from marriage. This is consistent with substantial improvements in the employment and financial positions of single mothers as a result of the reform (Francesconi and van der Klaauw, 2007; Gregg *et al.*, 2009), which might have provided an attractive 'outside option' to mothers married to low earning partners, and is also consistent with an WFTC-induced decline in the marriage rate for lone mothers reported by Francesconi and van der Klaauw (2007). In terms of the conditions underlying scenario Case 2 described in Result 5, this suggests that for women in poorer households the more generous tax credit led to a greater utility increase for women outside marriage, with husbands either unable to counter this through a reduction in child support payments when divorced or unable to compensate for this increase by reallocating resources within marriage. In the next subsection we consider a more disaggregated analysis of this finding.

The remaining rows of Table 6 include estimates of the impact of WFTC on several additional outcomes. On average, during the post-reform period, the probability that a married woman received a WFTC award did not change significantly when compared to the pre-reform period (second row, Table 6). However, in line with our theoretical predictions for type A households, this probability increased significantly by about 3 percentage points among women with a partner who did not work or worked fewer than 16 hours per week. Among women married to men working more than 16 hours per week but with relatively low earnings, we also find an increased probability of WFTC receipt but this increase is not statistically significant; whereas, for women married to the high-earning partners, we find essentially a zero effect on the likelihood of receiving WFTC. These estimates are entirely in line with the theoretical comparative statics results discussed in Section 2. Interestingly, we do not find any effect of the reform on the probability of IS receipt

<sup>27</sup> Francesconi and van der Klaauw (2007) provide an analysis of marital status choices using BHPS data for lone mothers but not for married women.

Table 6  
*The WFTC Effects on Married Women's Outcomes Other than Employment*

Outcome	All households	Partner does not work or works fewer than 16 hours a week	Partner works 16+ hours a week with low earnings	Partner works 16+ hours a week with high earnings
Divorce rates*	0.007 (0.011)	<i>0.024</i> (0.011)	0.009 (0.012)	0.001 (0.016)
<i>N</i>	18,917	4,089	4,980	9,848
FC/WFTC receipt <sup>†</sup>	0.011 (0.020)	<i>0.033</i> (0.012)	0.018 (0.021)	0.004 (0.011)
<i>N</i>	10,162	1,731	2,644	5,787
Income Support receipt <sup>‡</sup>	-0.003 (0.014)	-0.001 (0.014)	-0.002 (0.002)	-0.004 (0.003)
<i>N</i>	22,146	4,994	5,982	11,170
Paid childcare utilisation <sup>§</sup>	0.007 (0.010)	0.008 (0.024)	<i>0.023</i> (0.011)	0.002 (0.013)
<i>N</i>	7,436	469	1,566	5,401
Weekly childcare costs <sup>¶</sup>	0.78 (2.15)	0.04 (0.31)	0.34 (2.19)	1.02 (2.48)
<i>N</i>	1,517	120	364	1,033
Birth rates for married mothers**	-0.005 (0.006)	-0.010 (0.018)	-0.006 (0.012)	-0.003 (0.007)
<i>N</i>	6,890	1,010	1,793	4,087
Entry into motherhood <sup>††</sup>	-0.0007 (0.001)	-0.0003 (0.002)	-0.002 (0.002)	-0.0004 (0.0011)
<i>N</i>	9,673	2,422	1,987	5,264

*Notes.* Standard errors are shown in parentheses. Estimated coefficients in italics are statistically different from zero at the 5% significance level. *N* denotes the number of person-wave observations.

\*Estimates are obtained from linear probability models of transition into partnership breakdown on the sample of married childless women and married mothers with group-specific linear trends. For each woman, the dependent variable takes value zero if the woman is married, and value one in the period when her partnership (marriage or cohabitation) is dissolved (after which her observations are censored). Multiple entries for the same woman are allowed. Explanatory variables are listed in the note to Table 2.

<sup>†</sup>Estimates are obtained from linear probability models with individual fixed effects on the subsample of married mothers. Explanatory variables are listed in the note to Table 2, except for the term capturing the trend for married women without children.

<sup>‡</sup>Estimates are obtained from linear probability models with individual fixed effects on the sample of childless women and mothers. Explanatory variables are listed in the note to Table 2.

<sup>§</sup>Estimates are obtained from linear probability models with individual fixed effects on the subsample of mothers. The dependent variable takes value one if the mother works, has at least one child aged 12 or less, and pays for childcare arrangements, and zero otherwise. Explanatory variables are listed in the note to Table 2, except for the term capturing the trend for married women without children.

<sup>¶</sup>Estimates are obtained from linear regression models with individual fixed effects on the subsample of mothers who work, have at least one child aged 12 or less, and report positive expenditures on childcare arrangements. The weekly childcare expenditures are expressed in constant (2002) prices. Explanatory variables are listed in the note to Table 2, except for the term capturing the trend for married women without children.

\*\*Estimates are obtained from linear probability models of transition into birth on the subsample of married mothers from the second time they were observed in the panel onwards. Explanatory variables are listed in the note to Table 2, except for the term capturing the trend for married women without children.

<sup>††</sup>Estimates are obtained from linear probability models of transition into motherhood for the subsample of married women without children. For each woman, the dependent variable takes value zero if the woman is married childless, and value one in the period when she has a child (after which her observations are censored). Explanatory variables are listed in the note to Table 2, except for the term capturing the trend for married women with children.

among married women, either as a whole (first column) or for any of the three subgroups (next three columns). However, given the low share of households in our sample who are actually eligible and receiving IS prior to the reform (less than 3%), this result is not very surprising.

In Section 2, we discussed the positive effect of the childcare component of WFTC on the use of paid childcare services among eligible mothers. This positive response, however, might be offset by negative income effects driven by the increases in the credit base amount and the threshold, which work in the opposite direction. The estimates in Table 6 (fourth and fifth rows) indicate virtually no effect on average. The only positive and significant impact emerges for women married to men working at least 16 hours per week and with low earnings. Because the childcare credit component is available only to couples where *both* partners work more than 16 hours per week, the absence of an effect for the first group is entirely reasonable. The increase in childcare usage for women married to low earning men in eligible employment, on the other hand, appears to reflect primarily an increase in eligibility or take-up among the subset of these women in eligible employment, as the results in Tables 3–4 did not detect a sizeable increase in eligible employment among this group of women.

Finally, the reform could have changed fertility patterns of both married mothers (by altering their subsequent fertility decisions) and married childless women (by changing their likelihood of entering motherhood). As shown in Table 6 (last two rows), both such transitions were slowed down by WFTC, but these effects are small and never statistically significant, irrespective of the subgroups of mothers we consider. On the basis of these results, therefore, we conclude that our treatment of fertility as exogenous to labour supply, childcare and marital status decisions, is reasonable.

### 3.7. *Heterogeneous Impacts on Divorce*

Finally, given the lack of significant differences between low and high-education women on the one hand, with large variation in labour supply responses revealed in Table 3 by the number and ages of children on the other hand, it is of interest to examine whether the WFTC's impact on divorce is similarly heterogeneous. The estimates in Table 7 show comparable increases in the divorce rates for low- and high-educated women whose husband worked fewer than 16 hours per week, but reveal significant variation with the number and ages of children. As was the case with the mother's labour supply responses in class A households, the impact of divorce was greatest in households with young children. As discussed earlier, the increase in the child credit under WFTC was particularly large for families with young children. Moreover, the increased generosity of the child care credit implied potentially very large utility gains associated with eligible employment in divorce, while no such gains existed if the mother remained married to a husband working fewer than 16 hours per week. The requirement for both parents to work at least 16 hours per week may therefore inadvertently have contributed to a considerable increase in the divorce rate for a subset of married women.

Table 7  
*The WFTC Effect on the Probability of Divorce among Couples with Children*

	Male partner does not work or works fewer than 16 hours a week and wife's education is:		Partner works 16+ hours a week and has low pre-reform earnings and wife's education is:	
	Low	High	Low	High
Overall	0.022 (0.014)	<i>0.026</i> (0.013)	0.003 (0.013)	-0.001 (0.010)
One child aged 0-4	<i>0.039</i> (0.008)	<i>0.038</i> (0.016)	0.015 (0.015)	0.002 (0.019)
One child aged 5-10	0.023 (0.018)	0.034 (0.016)	0.0001 (0.018)	0.001 (0.013)
One child aged 11-18	0.016 (0.024)	0.019 (0.022)	0.004 (0.027)	-0.004 (0.010)
Two children or more, youngest 0-4	<i>0.027</i> (0.012)	<i>0.026</i> (0.013)	0.006 (0.019)	0.002 (0.014)
Two children or more, youngest 5-10	0.012 (0.022)	0.015 (0.028)	-0.001 (0.031)	-0.002 (0.018)
Two children or more, youngest 11-18	0.009 (0.024)	0.016 (0.020)	-0.002 (0.022)	-0.003 (0.027)
Observations	2,142	1,947	5,160	4,688

*Notes.* Standard errors are shown in parentheses. Estimated coefficients in italics are statistically different from zero at the 5% significance level. Estimates are obtained from linear probability models of transition into partnership breakdown on the sample of married childless women and married mothers with group-specific linear trends. For each woman, the dependent variable takes value zero if the woman is married and value one in the period when her partnership (marriage or cohabitation) is dissolved (after which her observations are censored). Multiple entries for the same woman are allowed (see first row of Table 6). The couples' position in the male earnings distribution is based only on the (wave-specific) position in the monthly gross earnings distribution observed before the introduction of the WFTC reform. Explanatory variables are listed in the note to Table 2.

#### 4. Conclusion

In October 1999, the Working Families' Tax Credit replaced Family Credit as the main package of in-work support for low-income families with children in Britain. Although it was replaced by new tax credits in 2003, many of its key principles remain operative to date (Brewer *et al.*, 2009). This article examines the impact of 1999 WFTC reform on married couples using for the first time longitudinal data drawn from the British Household Panel and collected between 1991 and 2002.

Our study contributes to the existing literature in two important ways. First, it develops a bargaining model of household decisions which offers a number of implications to examine the incentives for female employment and divorce generated by WFTC in two-parent households. One of the most insightful results of the model is the identification of highly heterogeneous responses to the in-work benefit reform depending on the household's position in the male earnings and hours distributions. Second, it considers effects on a broad set of socioeconomic outcomes, some of which have never been examined before for British couples. Our empirical analysis identifies the effect of WFTC through comparisons of changes in behaviour for married mothers and married women without children, and uses specific aspects of the reform design and panel nature of the data to understand how the estimated responses came about.

We stress four policy-relevant empirical results. First, the financial incentives of the reform had overall virtually no effect on many aspects of behaviour of married mothers, such as eligible and full-time employment, employment transitions, childcare utilisation and divorce rates. Second, women's responses were however highly heterogeneous and – in line with the theoretical predictions – depended upon their partners' labour supply and earnings. Mothers married to low-income men showed larger responses in employment, especially if they had younger children. They were more likely to remain in the labour force and had higher rates at which they entered it. While more likely to receive the tax credit, they also experienced a greater risk of divorce. Third, we find instead no effect for women with higher-income husbands. Fourth, there are also no statistically significant responses among married men.

On the policy side, the result that WFTC had strong employment and divorce effects on married mothers in poor households is very important. These women are effectively 'similar' to single mothers and, as stressed by our findings, they are more vulnerable to become such. Indeed, the better employment position of single mothers as a result of the reform (as documented in Francesconi and van der Klaauw (2007) and Gregg *et al.* (2009)), in part through its more generous childcare provision, could have generated a valuable 'outside option' to mothers partnered to low-earning men. This response could have been an unintended consequence of the reform, which may turn out to be important for the evaluation of the longer-term success of the reform itself.

This result echoes one of the findings delivered by our theoretical analysis. That analysis in fact can help us understand why the childcare component of WFTC might have not been strong enough to induce more couples with children into eligible employment and marriage: essentially because both husband and wife had to work 16 or more hours per week in order to receive the childcare credit of WFTC. This additional requirement may help explain why the estimated employment effects for married women with low-income partners are smaller than those estimated for single mothers. Moreover, while this improvement in the relative economic position of single mothers may have led to an increase in bargaining power of married women (especially those in poorer households), it also reduced the overall gains from marriage, resulting in a greater risk of family disruption. To be able to evaluate the impact of alternative in-work benefit reforms and to assess the relative importance of each component of the WFTC reform (such as the childcare tax credit), a natural extension is to follow Chiappori *et al.* (2002), Blundell *et al.* (2005; 2007) and use the available data to estimate the structural parameters of our theoretical model. Ideally such a model would include several important extensions, the most important of which would be to allow for remarriage, court-mandated child support payments and a more complex tax/benefit system in which other public transfers and programmes interact with WFTC (such as Income Support, Housing Benefit, and various New Deals).

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