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ABSTRACT

Lone Parents, Time-Limited In-Work Credits and the Dynamics of Work and Welfare*

Time-limited in-work credits are cheaper, and more targeted, than conventional in-work credits, but are thought to have small to zero long-term impacts. We study two time-limited in-work credits introduced in the mid-2000s in the UK and find they reduced welfare participation and increased employment. Both policies increased job retention once recipients were in work and boosted employment even after the payments were stopped. Conditioning on hours of work was important. Paying a credit to those working 16+ hours a week only increased part-time work, while conditioning on full-time work reduced part-time work and increased full-time work.

JEL Classification: H21, I38
Keywords: in-work credits, time-limits, duration model, lone parents

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1 Introduction

In-work transfers or tax credits are well established as a policy instrument in many countries for increasing labour supply and tackling poverty. However, because in-work tax credits can be paid indefinitely, they are expensive for government to provide.[1] In comparison, time-limited in-work credits that are paid to former welfare recipients who move into work should be considerably less expensive because they are only paid for, at most, a few years. And, by conditioning on previous receipt of welfare, they may also be better targeted on low-potential-wage individuals than conventional tax credits. However, to date, most of the evidence on the effectiveness of these time-limited credits come from the Self Sufficiency Project (SSP) in Canada, where evidence suggests that the incentives had little or no long term impact on employment or wages (see Card and Hyslop (2005)).

This paper comes to a more positive conclusion on the advantages of time-limited in-work benefits. We exploit the piloting of two time-limited in-work credits for lone parents in the United Kingdom in the mid 2000s to answer two important questions. First, can time-limited in-work credits lead to sustained increases in employment? Second, does incentivising part- or full- time work lead to very different outcomes? Our answer to both questions is yes. We find that both time-limited credits got more lone parents off welfare and into work, and especially so for the credit that was conditional on full-time work. Once in work, both programs incentivised lone parents to stay in work, and the increase in employment (and reduction in welfare participation) persisted even after the payments were stopped. Second, we find that whether the

[1] Federal funding for the Earned Income Tax Credit in the United States was $63 billion in 2013 (Nicols and Rothstein (2016)) and the UK government spent almost £21 billion on tax credits to working families in 2014-15 (HMRC (2016)).

policy incentivised part- or full- time work was extremely important. Paying an in-work credit to those working 16 or more hours per week modestly increased part-time work, but not full-time work at all. However, paying a credit only to those working 30 or more hours a week led to more lone parents working full-time, fewer not working at all, and fewer working part-time. This shows that lone parents respond not only to the extra incentive to work on the extensive margin, but on the intensive margin too.

These are important results for two reasons. Our latter finding shows that when designing policies to increase the labour supply of a group (lone parents) that has low employment rates, governments must think carefully about whether they are incentivising only part-time or full-time work. This is particularly important given there is known to be a higher return to experience for full-time work than to part-time work (see, for example, Blundell et al. (2016)). Second, it suggests that time-limited in-work credits may after all be an effective policy tool, despite the conclusions drawn from the Canadian SSP project: when introduced in the UK, we find they led to sustained increases in employment through job entry and job retention effects, and lead to increases in employment that persist after the in-work credits have stopped being paid.

The two programs exploited in this paper were time limited in-work credits paid to lone parents who had previously been on welfare. They were known as "In-Work Credit" (IWC) and the "Employment, Retention and Advancement Demonstration" (ERA). IWC was paid to lone parents who had been on welfare for at least a year if they moved into work of 16 or more hours per week. The credit was worth £40 per week and was paid for a maximum of 12 months. ERA paid £400 for every 17 weeks of full-time work (short gaps out of work were disregarded), for a maximum of 6 payments (or 2 years).

We estimate the impact of these programs using rich administrative data on lone parents' spells on welfare and in employment, and a multi-state, multi-spell discrete time duration model with unobserved heterogeneity. This model accounts for the ways in which the programs affected individuals' incentives to move into and out of work, and how these incentives change over time, in a similar way to Card and Hyslop (2005)'s analysis of the Canadian SSP program. It also allows us to estimate the impact on part-time and full-time work separately, which is critical for us to compare the two programs. Moreover, the model allows us to isolate the impact of the programs on the probability of leaving welfare and on the probability of remaining in employment, once individuals have moved into work. Because the programs were introduced in different parts of the country at different times (and in the case of IWC, eventually rolled out nationally), we can identify the impact of the two programs using a difference-in-differences style design.

This paper contributes to the literature which seeks to understand the labour supply decisions of groups that historically had low labour force participation, such as lone parents. There is a large literature on the effects of conventional in-work credits on labour supply in OECD countries (for example, see Nicols and Rothstein (2016) for a review of the research on the EITC, Brewer et al. (2006) for evidence on the UK's WFTC, Stancanelli (2008) for an example from France, and Bettendorf et al. (2014) who study an in-work credit in the Netherlands). However, there is much less work understanding the responses to time-limited in-work credits, partly because they are significantly less common. Evidence on the impact of time-limited in-work credits is based mainly on the Self-Sufficiency Project (SSP), a large-scale demonstration project in Canada in the 1990s (see Card and Hyslop (2005, 2009)). The SSP was available to lone parents who had spent at least a year on welfare,

and who then left welfare and moved into full-time work. SSP could be paid for three years, but if lone parents did not move into work within a year of being enrolled into the program, then they could never receive SSP. Card and Hyslop (2005) found that the SSP significantly increased the proportion of lone parents in full-time work and reduced the proportion on welfare. However, they found that it was the incentive to enter full-time work within one year of being enrolled onto the program that was particularly important in moving lone parents into full-time work. This "establishment" effect meant that the largest impact on employment came 15 months after random assignment; after this point, the effect on employment dropped gradually but substantially so that Card and Hyslop (2005) found no long-run impact on either wages or on welfare participation. [2]

Other examples of time-limited in-work credits are a program introduced in the Netherlands in the early 2000s studied in van der Klauw and van Ours (2013), and the ERA program for the long-term unemployed studied in Dorsett (2014). van der Klauw and van Ours (2013) assess the impact of a policy which, between 2000 and 2002, meant welfare benefit recipients in Rotterdam who had been on welfare for at least a year would receive a payment of €450 if they found a job which lasted 6 months, with a further payment of €450 every 6 months if they were still in work, up to a maximum of 4 payments over 2 years. Although this policy was characterised as a "re-employment bonus", the payments are similar in structure to those in the UK's ERA program. However, the study finds no impact of the offer of the

[2]More recently, though, Riddell and Riddell (2016) have argued that other programs introduced in the Canadian provinces where SSP was introduced confounded the evaluation of SSP, and that, controlling for these other programs, SSP did lead to lasting reductions in welfare participation and increases in labour force participation. Michalopoulos et al. (2005) also find that SSP increased full-time work by enough so that the experiment paid for itself, as higher SSP payments were offset by lower welfare payment and higher tax revenues.

payments on the probability of being employed. Dorsett (2014) uses a multi-state, multi-spell duration model (in a similar way to this paper) to estimate the impact of ERA on the long term unemployed (but he does not look at lone parents). He finds that, although ERA significantly increased flows off of welfare, it had only a modest (and statistically insignificant) impact on the probability of individuals remaining in work once they had found a job. Dorsett (2014) also did not have access to data which would have allowed him to look at the separate effect on full-time work (which was incentivised by ERA) and part-time work (not incentivised by ERA). Finally, the programs we study have previously been examined in evaluations commissioned by the UK government. Using experimental methods, (Dorsett et al. (2007) find that ERA significantly increased the fraction of lone parents in work, but did not attempt to understand this impact in terms of its effect on flows on and off and welfare and into and out of work. This is also a limitation of an early quantitative assessment of IWC in Brewer et al. (2009).

Our paper is also relevant to those estimating wage progression of low skilled workers. One of the original motivations for time-limiting in-work credits is that the returns to experience would lead to wage gains that would make in-work credits unnecessary. As we outlined above, this did not seem to happen for the SSP recipients. However, Grogger (2009) investigates the impact of a welfare reform in Florida which increased the incentive to work, finding that the program raised wages significantly because those former welfare recipients moving into work saw significant wage returns to experience: one year's work increased future wages by over 5%. On the other hand, Ferrall (2012) attributes the lack of a long-term effect of SSP on employment to a lack of job market opportunities and slow skill acquisition, as well as high discount rates. Although we cannot estimate the impact of IWC or ERA on

wages, we do find that the impact of these programs lasts beyond the point at which credits are paid.

The rest of the paper is arranged as follows. Section 2 explains in full how these policies operated and what impact we would expect them to have on work and welfare dynamics, Section 3 sets out the model we estimate, and Section 4 discusses our administrative data and provides some data descriptives. Our results are in Section 5, and we conclude in Section 6. Appendices contain supplementary policy details, data tables, and coefficient estimates.

2 Policy detail, and the expected impact of the programs

This paper studies two programs: In Work Credit (IWC) and Employment, Retention and Advancement Demonstration (ERA), both piloted initially in the middle of the 2000s in the UK. In this section, we explain how the two programs operated, and how they affected financial incentives to work.

2.1 Details of the IWC and ERA programs

In Work Credit (IWC) was available to lone parents in the UK who had been receiving out-of-work welfare for a continuous period of 12 months or more;[3] and who then moved into work of at least 16 hours per week. It was payable at a rate of £40 per week for up to 12 months (from July 2007,

[3]We use "welfare" throughout to refer to what are known in the UK as "out-of-work benefits". The relevant benefits were Income Support, Jobseeker's Allowance, Incapacity Benefit, Employment and Support Allowance, Carer's Allowance and Severe Disablement Allowance. Although precise details vary, entitlement to these benefits requires claimants NOT to be working (or to be working only a handful of hours a week) and to have a low family income. For more details on the UK benefit and tax credit system, see Browne and Hood (2012).

£60 a week in London). Payments stopped after 12 months, or if the lone parent stopped working (very short periods out of work were over-looked), or if the lone parent re-claimed welfare benefits. Lone parents had to provide payslips as evidence that they were still in work; employers had no other role, and would not normally know whether their employees were receiving IWC. The payments were made weekly in arrears, and were not means-tested, nor taxable, nor did they count as income for the purpose of other means-tested welfare benefits or tax credits. Repeat claims of IWC were allowed, but only if a lone parent spent a further 12 months on welfare to regain potential eligibility. Over a four year period – starting in 2004 – and in six steps, IWC was gradually rolled out across all of Great Britain.[4]

The Employment, Retention and Advancement (ERA) demonstration was a randomised intervention which aimed to deliver the 'next step' in welfare-to-work policy. It had three target groups: unemployed lone parents who were on *Income Support* (IS) and then volunteered for the New Deal for Lone Parents (NDLP; this was a voluntary program that provided greater access to Personal Advisors, and access to some discretionary funds to assist in job search[5]), lone parents working part-time and receiving *Working Tax Credit*, and long-term unemployed individuals over the age of 25. It is the first of these client groups that is of interest here, as it is similar to the client group targeted by IWC. The two differences are that ERA additionally required lone parents to have joined the NDLP program, something which tended to

[4]Appendix A gives full details. Additionally, Appendix Table A3 shows that the areas operating the ERA program and in which the IWC policies were first introduced had higher unemployment rates, on average, than the rest of Great Britain; it also shows that unemployment rates rise at the end of the period covered by our data as the 2008 financial crisis hits. However, these differences are not especially large, and we allow for the local area unemployment rate to affect all transitions. Neither IWC nor ERA was introduced in Northern Ireland.

[5]See Dolton et al. (2006) for details and for an evaluation of its impact.

be done by those lone parents who were keen to move into work soon, as they got access to additional support from a personal adviser, and that ERA did not require lone parents to have been on welfare for a year.

ERA specifically targeted retention by way of a retention bonus: a payment of £400 in each 17-week period, paid to clients in the program group if they worked full-time (30 hours or more) for at least 13 weeks in the 17 week period. Participants could receive at most six such payments, which would cover a maximum period of two years. Payments also stopped when the individual ceased to be part of the ERA program, which occured 33 months after randomisation. Inflow into the ERA program took place between 2003 and 2005. [6]

IWC and ERA are by no means the only form of support for lone parents in the UK. The other welfare benefits and tax credit to which these lone parents might be entitled are as follows:[7]

1. A non-means-tested *child benefit*, worth £17.45 a week for families with 1 child;

2. A means-tested refundable *child tax credit*, worth £44.42 a week for families with 1 child and an income under £14,155 per year (and withdrawn at 37% after that);

3. At most one of the following:

   (i) A means-tested refundable *working tax credit*, worth up to £63.55

[6]The ERA program also provided "Advancement and Support Advisors", who advised participants on how to secure long-term work with advancment/progression. In addition, there were a series of incentives to undertake training: £1,000 for fees of courses undertaken while working at least 16 hours per week, as well as a training bonus, paid at £8 per hour (up to a maximum of £1,000) if completed within 33 months after randomisation. See Dorsett et al. (2007) for more details.

[7]All amounts for 2006-07; there is more analysis of the financial work incentives facing lone parents in the UK in Brewer et al. (2007) and Brewer et al. (2009)

a week but conditional on working 16 or more hours a week, and withdrawn at 37% for annual earnings above £5,220;

(ii) A means-tested welfare benefit (*income support*), worth £57.45 a week, but conditional on working less than 16 hours a week, withdrawn at 100% after a weekly earnings disregard of £15;

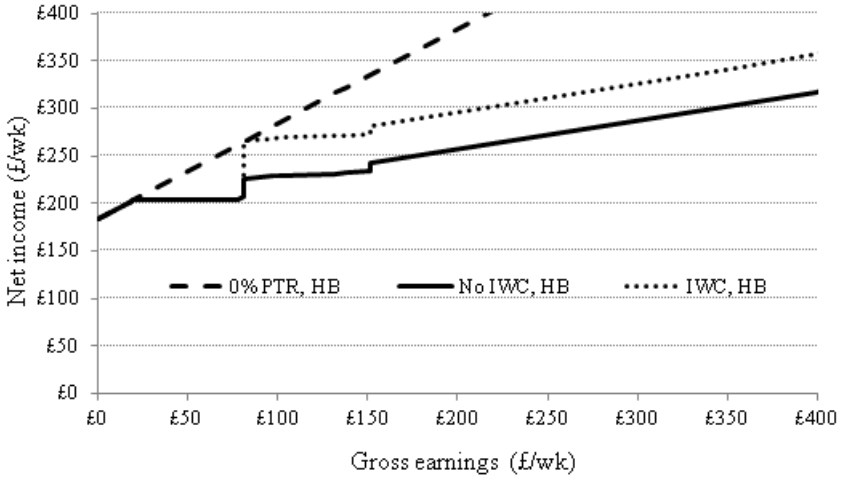
4. Cash benefits which rebate spending on rent, and liabilities to local tax (the former is known as *Housing benefit*, and the latter is *council tax benefit*); these programs are both withdrawn steeply once entitlement to welfare benefits has been fully withdrawn.

Figure 1 shows the relationship between gross earnings and net income after subtracting liability to all direct taxes and adding entitlement to all welfare payments and tax credits. The figure assumes an hourly wage of £5.05 (which was the national minimum wage roughly halfway through the data covered in this paper), and so weekly pre-tax earnings of £80.80 correspond to 16 hours a week work, which is a key threshold in the UK's tax credit and welfare system. The figure shows the relationship with and without IWC for a lone parent with one child, and who lives alone, paying and receiving a means-tested rebate on a modest rent. Without IWC, there is already a notch in the budget constraint at earnings levels which correspond to 16 hours work a week: at this point, lone parents lose entitlement to welfare benefits, but gain entitlement to (the more generous) regular in-work tax credits (*working tax credit*). IWC makes this notch considerably larger, bringing the average effective tax rate on low-earnings work close to zero, which Saez (2001) and Brewer et al. (2010) argue may well be optimal given what we know about lone parents' responsiveness to the financial payoff to work.

Finally, it is important to note that lone parents receiving welfare benefits

in most of the years spanned by our data had to fulfil extremely weak conditions in order to maintain eligibility, with no requirement to be working, or even to be looking for work, until their youngest children were aged 16. [8]

Figure 1: Budget constraint for a lone parent with one child with and without In-Work Credit



Note: Assumes rents of £60 a week that are fully met by Housing Benefit when on welfare.

2.2 The expected impact of IWC and ERA on flows between welfare and work

Given the structure of the ERA and IWC, we can set out how these programs change the incentives to work and to claim out-of work welfare payments. Card and Hyslop (2005, 2009) set up a simple search model, and analyse how the SSP affects incentives and behaviour. The changes in incentives induced by IWC and ERA are slightly simpler than those caused by SSP, but based on the considerations in Card and Hyslop's papers, as well as past evidence from similar programs, the following responses to IWC and ERA are likely:

[8] These rules were changed towards the end of the period covered by our data, with the implication that lone parents had to look for work like other unemployed workers, and we deliberately right-censor observations a year before individuals are affected by this change; see Avram et al. (2016) for evidence of this reform's impact.

(i) IWC should make it more likely that a *potentially eligible*[9] lone parent in a district operating IWC leaves welfare and starts a job of at least 16 hours a week. An income effect might reduce the gross earnings of such jobs or reduce the number of hours worked (but not below 16).

(ii) ERA should make it more likely that a potentially eligible lone parent leaves welfare and starts a job of at least 30 hours a week. An income effect might reduce the gross earnings of such jobs or reduce the number of hours worked (but not below 30).

(iii) Having left welfare for a job, IWC should make it more likely that its recipients stay in work of at least 16 hours a week, but might (through an income effect) reduce moves to higher-earning jobs. This effect may decline gradually throughout the 52 week period of receipt, and may cease entirely when the 52-week time-limit of IWC payments is reached.

(iv) Having begun to receive ERA payments, ERA should make it more likely that its recipients stay in work of at least 30 hours a week. This effect may cease entirely when the 6 payments have all been made or the individual ceases to be part of the ERA program, which occurs after 33 months.

(v) Having begun to receive ERA payments, ERA should make it more likely that a former ERA recipient who is currently not in work of 30 or more hours moves into work of at least 30 hours a week (provided not all 6 ERA payments have been made and the individual is still part of the ERA program).

[9]We define that a lone parent is potentially eligible for IWC if they have been receiving welfare benefits for at least 12 months and lived in an area where IWC is being piloted; they would be eligible for IWC if they stopped claiming welfare and started a job of at least 16 hours per week.

(vi) The existence of IWC or ERA may induce some lone parents who would otherwise have left welfare to remain on welfare for longer in order to become potentially eligible for IWC or ERA. We call such responses "anticipation effects". For a lone parent who has been on welfare for less than 12 months and is considering delaying his exit from welfare in order to obtain eligibility for IWC, then the benefits would be the discounted value of up to £2,080 in IWC payments, and the direct costs would be the discounted value of the earnings (i.e. net of taxes paid and welfare lost) forgone during the period of delay. A more extreme response is that the existence of IWC or ERA may induce some lone parents who would not have claimed welfare at all to claim welfare in order to become potentially eligible for IWC or ERA.

Responses (i) to (v) are investigated in this paper; we do not allow for the anticipation effects discussed in (vi).[10]

3 Empirical model

We are interested in the impact that IWC and ERA had on initial job entry rates, moves between part-time and full-time employment, and job exits and flows back on to welfare. Accordingly, we follow Ham and Lalonde (1996) and Eberwein et al. (1997) to estimate a multi-state, multi-spell duration model to understand how the these in-work credits affect labour supply decisions.

In our model, we allow lone parents to be in one of 4 (exhaustive and mutually-exclusive) states:

(i) Receiving out of work welfare benefits ("On welfare")

[10]Card and Hyslop (2009) find evidence of such anticipation effects for lone parents in Canada who were potentially eligible for the Self-Sufficiency Project (SSP) program if they remained on welfare for 12 months.

(ii) In work of between 16 and 29 hours per week ("In part-time work")

(iii) In work of 30 or more hours per week ("In full-time work")

(iv) Neither receiving welfare nor in work of at least 16 hours per week ("None of the above")

In the absence of unobserved heterogeneity, we specify the probability of making a transition from state i to state j at time t as:

$$Pr(s_{t+1} = j | s_t = i) = \frac{U_{ijt}}{\sum_k U_{ikt}} \tag{1}$$

This is subject to the normalisation that $\beta_{ii} = 0$ for all i and where:

$$U_{ijt} = exp(X'_{ijt}\beta_{ij}). \tag{2}$$

Given a sequence of states, the log-likelihood for an individual is:

$$logL = \sum_t \sum_{i,j} \mathbf{1}[s_{t+1} = j, s_t = i] log((Pr(s_{t+1} = j | s_t = i))) \tag{3}$$

All individuals are initially observed in the middle of a welfare spell (we sample individuals at the point that they volunteer for the NDLP program, which could occur at any point in their welfare spell), and so we treat the initial, "interrupted", welfare spell as a separate state to any subsequent "fresh" welfare spells (Eberwein et al. (1997)). This gives us 5 "origin" states, each of which has 3 other possible "destination" states.

As is standard in these models, the transitions are allowed to depend upon random effects. We assume this random effect, v, a vector of dimension 15 (one for each possible transition), takes a discrete distribution, and so we can think of individuals as being one of M types where such that $Pr(v =$

$v^m) = \pi^m$ and$\sum_{m=1}^{M} \pi^m = 1$. With unobserved heterogeneity, equation (2) is modified to:

$$U_{ijt}|v = v^m = exp(X'_{ijt}\beta_{ij}) + v^m_{ij}, \quad \beta_{ii} = 0, v_{ii} = 0 \ \forall i. \tag{4}$$

Alternatively, we can say that, conditional on being in state i at time t, each state j is associated with a level of net utility,

$$V_{ijt}|v = v^m \ = \ U_{ijt} + v^m_{ij} + \varepsilon_{ijt}, \tag{5}$$

where ε_{ijt} are Type-I extreme value errors, and where each individual moves from the origin state i to the destination state j with the highest value of net utility; we use this formulation explicitly when simulating (see Section 4.3).

Either way, the log-likelihood contribution for an individual becomes:

$$logL = log\left\{\sum_m \pi_m \prod_t \prod_{i,j} (Pr(s_{t+1} = j|s_t = i, v = v^m)^{\mathbf{1}[s_{t+1}=j, s_t=i]})\right\}, \tag{6}$$

where X_{ijt} are transition-specific, time-varying, explanatory factors. As discussed in Section 4, we had access to only a small set of explanatory variables: number of children, age of youngest child, adult's age, calendar time (in years and months), indicators for living in each of the pilot phases, and local unemployment rates. The exact variables used in the model are shown in (Appendix) Table A4. When the origin state is "on welfare", these variables are allowed to change over time; when the origin state was anything else than "on welfare", only "calendar time", "duration", and "local unemployment rate" were time-varying: others were held fixed at the characteristics when the lone parent was last observed on welfare. Duration is controlled for using a quadratic in months, as well as a dummy variable for being the first

month of a spell (this is not necessary for "interrupted" spells of welfare, as no-one is observed in the first month of an "interrupted" welfare spell). In addition, we allow all the transitions out of welfare to depend upon a dummy for having spent at least 12 months on welfare, since it is after 12 months on welfare that lone parents can become potentially eligible for IWC. We also allow for the following policy effects to be included in the vector X_{ijt}:

(i) the probability of transiting *from* a spell of welfare *to* work of 16 or more hours a week depends upon an indicator for being potentially eligible for IWC

(ii) the probability of transiting *from* a spell of welfare *to* work of 30 or more hours a week depends upon indicators for being potentially eligible for IWC or being in the ERA treatment group

(iii) the probability of transiting *from* work of 16 or more hours a week *to* any other state depends on an indicator for receipt of IWC

(iv) the probability of transiting *from* work of 30 or more hours a week *to* any other state depends on an indicator for receipt of IWC or ERA

(v) the probability of transiting *from* any other state *to* work of 30 or more hours depends upon an indicator for being a former ERA recipient who is still eligible for further ERA payments.

All effects of IWC are allowed to be different for those in London from July 2007, when payments increased to £60. Although the policies do incentivise staying in work, they do not change the relative incentive to be "on welfare" or "None of the above" (not claiming welfare). To reflect this, we constrain the coefficients on IWC receipt from part-time work to welfare and from part-time work to "none of the above" to be the same, the coefficients on IWC

receipt from full-time work to welfare and from full-time work to "none of the above" to be the same and the coefficients on ERA receipt from full-time work to welfare and from full-time work to "none of the above" to be the same.

Since potential eligibility for IWC and ERA depend upon calendar time, whether a lone parent is living a district operating IWC or ERA, and (for IWC) duration on welfare, these variables are also included as explanatory factors. This gives us a difference-in-difference style design, with three sorts of variation contributing to identification approach of the impact of the policies:

- from variation in the transition rates between lone parents in pilot and non-pilot districts observed at the same time and with the same duration on welfare;
- from variation in the transition rates between lone parents in the same district and with the same duration on welfare but at different points in calendar time (so that one is observed when IWC or ERA are in operation, and one is not);
- for IWC only: from variation in the transition rates among lone parents in the same area observed after the introduction of IWC but with different durations on welfare (we control for duration on welfare with a quadratic in the number of months, with a separate indicator for the first month of a spell, and for having a duration greater than or equal to 12 months).
- for ERA only: from variation in the transition rates among lone parents in the same area observed after the introduction of ERA but who are randomised into treatment and control groups.[11]

[11]Note that we do not estimate the impact of ERA experimentally; instead, we pool

4 Data and descriptive analysis

4.1 Data

We make use of administrative data owned by the UK Department for Work and Pensions and known as the Work and Pensions Longitudinal Study (WPLS). This consists of spells on welfare benefits and payments of IWC and ERA, along with measures of hours worked per week that were reported to HM Revenue and Customs by lone parents who claim a tax credit. For those individuals who claim a welfare benefit, we observe a limited number of characteristics: the number of dependent children, the age of the youngest child, their date of birth, and from the benefit records, we can observe whether they were claiming an disability benefit[12] at any point in the three years before joining the sample. From 2004 onwards, we are able to map in the unemployment rate of their local labour market.[13] To estimate the model, we turn the spell-based WPLS data into monthly, discrete-time data, by measuring the economic activity on the first day of each month. We use a set of simple rules to resolve inconsistencies and ensure that, in every month, each individual is in one and only one of the states listed.

Our population of interest is every lone parent who, since 1 May 2003 and whilst on welfare, volunteered to participate in the New Deal for Lone Parents (NDLP) program and lived in Great Britain.[14] We restrict the analysis

the experimental control group with other non-ERA recipients, who are informative about the impact of ERA under the usual common trends assumption required in difference-in-differences designs.

[12]We classify Incapacity Benefit, Employment and Support Allowance and Severe Disablement Allowance as disability benefits.

[13]The level of geography that we map in local unemployment at is called the "Travel to Work Area"; the data is available at www.nomisweb.co.uk.

[14]Neither IWC nor ERA operated in Northern Ireland. The choice of May 2003 is forced upon us because our measure of employment and hours worked is available only after April 2003, the date of a significant reform to the UK tax credit system.

to lone parents who participated in NDLP because this was the eligibility condition for participation in the ERA program: the restriction means that our analysis sample is those lone parents who would have been eligible for the ERA demonstration (had it operated in their district at that time). We then follow these individuals until the earliest of the following: the lone parent's youngest child turns 15; 12 months before the lone parent had to undertake job search as a condition of receiving out-of-work welfare payments[15]; December 2009.

4.2 Descriptives

We drew a sample of 10,000 individuals on which to estimate the model, oversampling participants in the ERA program and from areas that operated IWC before the national roll-out. This sample of over 10,000 lone parents gives us 395,629 person-month observation points. Table 1 shows the number of transitions for individuals in our sample. Just over a third (36.1%) of the individuals have no observed transitions (meaning that they remain in their initial interrupted spell of welfare), but just over 40% have 2 or more transitions.

Appendix Table A1 compares the observed characteristics of individuals who are eligible for IWC and do not move into work of 16 or more hours, with those who are eligible for IWC and do move into work. Those who move into work have, on average, been on welfare for fewer months, are older, have an older youngest child and live in an area with a lower unemployment rate.

[15] A reform from late 2007 meant that lone parents could no longer claim Income Support as a lone parent, and instead had to claim a different benefit to which job search conditions applied. In the period covered by our data, the reform affected lone parents whose youngest child was born before 2000. See Appendix A of Avram et al. (2016) for details on the exact point that lone parents are no longer eligible for Income Support; we right-censor observations 12 months before they are due to be affected by the job search requirements.

Table 1: Number of observed transitions

Number of transitions	*Number*	*Proportion*
0	3,601	36.01%
1	2,371	23.71%
2	1,319	13.19%
3	1,029	10.29%
4	577	5.77%
5	404	4.04%
6 or more	699	6.99%
Total	10,000	100.00%

Source: Authors' calculations using the WPLS as described in section 4.1

Appendix Table A2 is the equivalent for the ERA program.

4.3 Estimation and simulation

We estimated the model given in equation (6) by Maximum Likelihood. We set M, the number of unobserved types, to 2. Having obtained coefficient estimates, we use simulation methods to produce estimates of the impact of the two programs on more meaningful outcomes, such as the fraction of lone parents on welfare or in work at a given point in time (as recommended by Eberwein et al. (2002)); a recent example is Ham et al. (2016)). The principle behind using simulation methods is as follows: given a vector of coefficient estimates $\hat{\beta} = \left\{\hat{\beta_{ij}}\right\}$ and observed values for $\{X_{ijt}\}$, then a set of errors $\{\varepsilon_{ijt}\}$ drawn from a Type-I extreme value distribution will, by equation (5), be sufficient to determine the transition made at each t. We can in this way produce a complete simulated "history" for each individual.

To simulate the impact of IWC and ERA, we modify this process in two ways.

1. For each individual, we draw a set of $\{\varepsilon_{ijt}\}$ from an appropriately truncated Type-I extreme value distribution which, having applied the simu-

lation method described above, replicates the actual sequence of transitions chosen (this is sometimes referred to as drawing calibrated errors). Of course, this method produces calibrated errors $\{\varepsilon_{ijt}\}$ only if the individual was in origin state i at time t; for the error draws corresponding to other origin states at time t, we draw uncalibrated errors from a Type-I extreme value distribution.

2. holding these calibrated error draws constant, we simulate two histories for each individual, one in which we hold all policy dummies equal to their actual values, and another where we set all policy dummies to zero.

By construction, the first of these simulated histories is identical to the actual sequence of transitions, and the second represents a counter-factual sequence of transitions that would be made in the absence of the IWC and ERA program, and so the difference between these two sequences of transitions represents the impact of the programs. We can then take the difference in any outcome (e.g. proportion on welfare) with and without the program in place, at any point we are interested (e.g. 6 months after first being potentially eligible), and this produces an estimate of the impact of the program on those who received it. To reflect unobserved heterogeneity, we further do this separately for each "type", drawing a different set of calibrated $\{\varepsilon_{ijt}\}$ for each type v^m, and use a (weighted) average over the M types. Finally, we repeat these simulations 100 times, using a different set of calibrated errors in each simulation, and what we report is the average impact of the policies across the 100 simulations.

A variant to this process allows us to decompose the overall impact of the policies into that due to a *welfare-leaving* effect, and that due to a *job*

retention effect. To implement these, we simulate a counter-factual set of transitions having set to zero only those policy dummies that affect transitions *from* part-time or *from* full-time work states. That is, we allow IWC and ERA to alter flows from welfare into part-time and full-time work, but we "turn off" any impact they have on flows out of part-time or full-time work. A comparison between the actual transitions chosen and these simulated transitions having turned off any impact of the policies on flows from work states gives the *job-retention* effect, and the difference between the overall impact and the job-retention effect is defined as the *welfare-leaving* effect.

To put confidence intervals around all of these simulated policy effects, we follow Ham and Woutersen (2013). This involves the following additional process:

1. we draw 100 random coefficient vectors, $\tilde{\beta}$, from a joint normal distribution whose mean is given by the model's estimated coefficient vector, $\hat{\beta}$, and whose variance is given by the estimated covariance matrix of the model's coefficients.

2. for each of these 100 coefficient vectors, we simulate the impact of the policies on some outcome of interest, as described above. Specifically, for each draw of a random coefficient vector, we calibrate 10 sets of errors such that the observed transitions are consistent with these errors and we calculate the policy impact as the average of that given for the 10 sets of errors.

3. the $(1-\alpha)\%$ confidence interval of policy impacts is defined as the set of simulated policy impacts corresponding to those random coefficient vectors, $\tilde{\beta}$, which fall within the $(1-\alpha)\%$ confidence interval of the coefficient vector.

5 Results

5.1 Estimated coefficients

Estimated coefficients are shown in Table A4. Examining the coefficients on the policy indicators show that:

- IWC potential eligibility makes transitions from welfare to part-time work more likely
- IWC receipt makes transitions out of part-time work less likely
- IWC receipt make transitions from part-time work to full-time work less likely
- ERA potential eligibility makes transitions from welfare to full-time work more likely
- ERA potential eligibility makes transitions from part-time work to full-time work more likely
- ERA receipt makes transitions from full-time work to any other state less likely

These all accord with the financial incentives inherent in the programs. Amongst the non-policy variables, lone parents are more likely to leave welfare for work (of any kind), and to stay in work, when their youngest child is older, they have fewer children, and there is a lower local unemployment rate. The magnitudes of these impacts are hard to discern from estimated coefficients, and so we use the simulation process described in Section 4.3 to show the impacts of IWC and ERA on outcomes of interest.

5.2 Estimates of the impact of IWC

5.2.1 The impact of IWC on those who were potentially eligible for the program

We begin by examining the impact of IWC on those lone parents in our sample who were ever potentially eligible for it (this is akin to an "intention to treat" effect). As background, Figure 2 shows the economic status of individuals who are potentially eligible for IWC, from the first month that they are potentially eligible for the credit. All individuals are, by definition, on welfare at the point they become potentially eligible for IWC, but, after 12 months this fraction has fallen to 75%, at which point 13% are in part-time work and 5% in full-time work (the remaining 7% are in "None of the above"). The fraction on welfare continues to decline over time.[16]

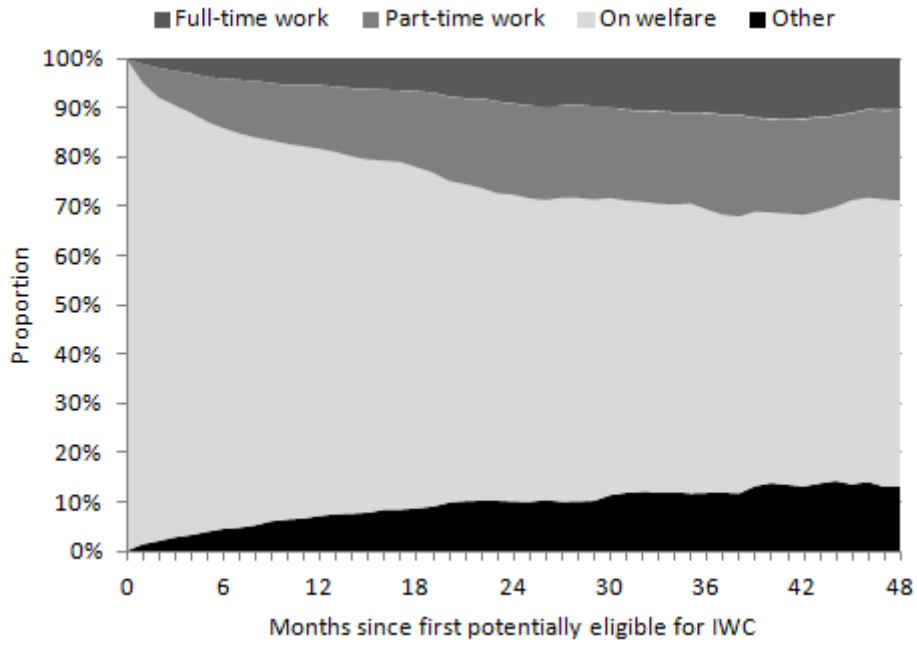
Table 2 shows the simulated impact that IWC has on the proportion of individuals undertaking each economic activity, at different numbers of months after first becoming potentially eligible for IWC.[17] Each row of the table shows the effect of IWC on the probability of undertaking a given economic actvitiy a certain number of months after first being potentially eligible for IWC. The 95% confidence interval for each effect is shown below the point estimate.[18]. The results show that the impact of IWC on employment is small, and not statistically significantly different from zero. The point estimates suggests IWC increases the proportion of potentially eligible individuals who are in

[16]The figure makes no correction for sample selection; Section 4.1 explained that individuals are right-censored either on December 2009, or at a date which is a function of the date of birth of their youngest child.

[17]The table omits the change in the proportion in "None of the above", which by construction has the same magnitude and opposite sign to the sum of the three numbers in a given row.

[18]The Ham and Woutersen (2013) method of producing confidence sets for complex functions of parameters that we use produces confidence intervals rather than standard errors.

Figure 2: Economic activity since first potentially eligible for IWC



Source: sample of lone parents from WPLS as described in section 4.2, who were ever potentially eligible for IWC.

part-time work by 1.6 percentage points measured 12 months after first being potential eligible, rising to 2.0 percentage points measured after 24 months. There is very little impact of IWC on the proportion in full-time work: the fact that IWC is conditional on being in work of at least 16 hours per week manages to encourage lone parents marginally into part-time work but not at all into full-time work, and, if anything, it slightly reduces the probability of being in full-time work, by 1.1 ppt after 24 months (although this effect is not statistically significant).

Tables 3 and 4 split the estimated impacts from Table 2 into two separate effects. Table 3 shows the impact that IWC had by encouraging lone parents to leave welfare, and Table 4 shows the impact that IWC had by encouraging lone parents to stay in work. Six months after first being potentially eligible, the welfare-leaving effect reduced the proportion of lone parents on welfare

Table 2: Impact of IWC for those potentially eligible on probability of being on welfare or in work

Number of months since first potentially eligible for IWC	Impact of IWC (ppt) on probability of being		
	On welfare	In part-time work	In full-time work
6	-0.007	0.011	-0.003
	[-0.022 , 0.016]	[-0.009 , 0.024]	[-0.013 , 0.008]
12	-0.008	0.016	-0.007
	[-0.026 , 0.024]	[-0.011 , 0.031]	[-0.022 , 0.007]
18	-0.008	0.019	-0.009
	[-0.028 , 0.030]	[-0.012 , 0.035]	[-0.026 , 0.007]
24	-0.004	0.018	-0.011
	[-0.025 , 0.038]	[-0.017 , 0.037]	[-0.033 , 0.007]
36	-0.008	0.020	-0.009
	[-0.030 , 0.035]	[-0.013 , 0.039]	[-0.032 , 0.009]
48	-0.012	0.020	-0.011
	[-0.035 , 0.032]	[-0.013 , 0.036]	[-0.032 , 0.005]

Notes: Policy impacts are calculated using the method described in section 4.3. 95% confidence intervals are shown in brackets below each estimated effect.

by only 0.6 percentage points (although this is not statistically different from zero), whereas (unsurprisingly) there was essentially no impact of the retention effect so early on. However, over time, the retention effect becomes larger; 24 months after first potential eligibility, the retention effect increases the proportion of lone parents in part-time work by 1.1 percentage points, an effect that is statistically significantly different from zero and accounts for around 60% of the total impact on part-time work.

Table 3: Impact of IWC for those potentially eligible on probability of being on welfare or in work: "Welfare Leaving" effect

Number of months since first potentially eligible for IWC	Impact of IWC (ppt) on probability of being		
	On welfare	In part-time work	In full-time work
6	-0.006	0.008	-0.002
	[-0.020 , 0.017]	[-0.012 , 0.021]	[-0.011 , 0.009]
12	-0.005	0.008	-0.003
	[-0.022 , 0.027]	[-0.019 , 0.024]	[-0.018 , 0.011]
18	-0.005	0.009	-0.005
	[-0.024 , 0.033]	[-0.020 , 0.026]	[-0.021 , 0.010]
24	0.000	0.007	-0.007
	[-0.019 , 0.042]	[-0.028 , 0.026]	[-0.028 , 0.011]
36	-0.003	0.009	-0.005
	[-0.025 , 0.040]	[-0.024 , 0.029]	[-0.027 , 0.011]
48	-0.006	0.011	-0.005
	[-0.028 , 0.036]	[-0.021 , 0.027]	[-0.026 , 0.009]

Notes: Policy impacts are calculated using the method described in section 4.3. 95% confidence intervals are shown in brackets below each estimated effect.

Table 4: Impact of IWC for those potentially eligible on probability of being on welfare or in work: "Retention" Effect

Number of months since first potentially eligible for IWC	Impact of IWC (ppt) on probability of being		
	On welfare	In part-time work	In full-time work
6	-0.001	0.003	-0.002
	[-0.003 , 0.001]	[0.000 , 0.006]	[-0.003 , 0.001]
12	-0.003	0.008	-0.003
	[-0.007 , 0.002]	[0.000 , 0.013]	[-0.006 , 0.001]
18	-0.004	0.009	-0.004
	[-0.008 , 0.002]	[0.000 , 0.015]	[-0.007 , 0.002]
24	-0.004	0.011	-0.004
	[-0.010 , 0.002]	[0.001 , 0.018]	[-0.009 , 0.002]
36	-0.005	0.012	-0.004
	[-0.011 , 0.002]	[0.001 , 0.018]	[-0.007 , 0.003]
48	-0.006	0.010	-0.005
	[-0.012 , 0.001]	[0.000 , 0.016]	[-0.009 , 0.001]

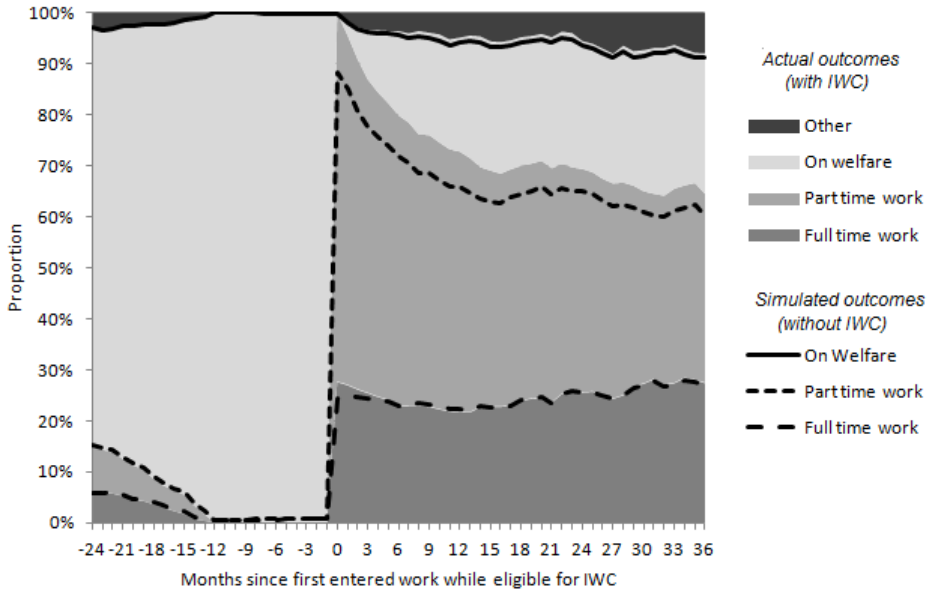
Notes: Policy impacts are calculated using the method described in section 4.3. 95% confidence intervals are shown in brackets below each estimated effect.

5.2.2 The impact of IWC on its recipients

An alternative way to look at the impact of IWC is to examine its impact only on its recipients. Figure 3 therefore shows the actual economic status of its recipients (as a stacked area graph), measured relative to the the time they first moved into work (and began to receive a IWC payment), and the counterfactual outcomes in the absence of IWC (as a stacked line graph superimposed on the figure). The differences in the outcomes at different points in time are summarised in Table 5.

The first row of Table 5 shows that, in the absence of IWC, 11.5% of those who in fact left welfare and moved into work with IWC in a given month would have stayed on welfare. This provides us with measures of additionality and deadweight: at the time when these individuals left welfare for work, 88.5% would have left welfare even without IWC (which is a measure of deadweight), with the remaining 11.5% representing additionality. This effect is statistically significantly different from zero. The simulations suggest that, after 6 months, 7.3% of those who actually left welfare for work and IWC would have still been on welfare in the absence of IWC. The fact that the apparent impact of IWC on reducing the fraction on welfare has fallen over these 6 months represents two factors: first, some of the 11.5% initially induced into work by IWC have left work and returned to welfare by 6 months. These effects are statistically significantly different from zero. Second, some of those who, in the absence of IWC, are simulated *not* to have left welfare for work at month 0 are simulated to have moved into work at some point in the following 6 months. Importantly, although the estimated impact of IWC on its recipients diminishes over time, it does not fall to zero after 12 months. This means that IWC had significant impacts on its recipients after

Figure 3: Economic activity of individuals who receive IWC payments, with (and in absence of) IWC



Source: Sample is those who ever moved into work while potentially eligible for IWC. Simulated outcomes are produced as described in section 4.3

the payments were no longer being made. This finding can also be seen in Figure 3: there is no sharp drop in the proportion of lone parents in work 12 months after lone parents move into work and receive IWC. Finally, IWC had no significant impact on the fraction of its recipients working full-time, with the essentially all of the additional employment coming from work of less than 30 hours a week.

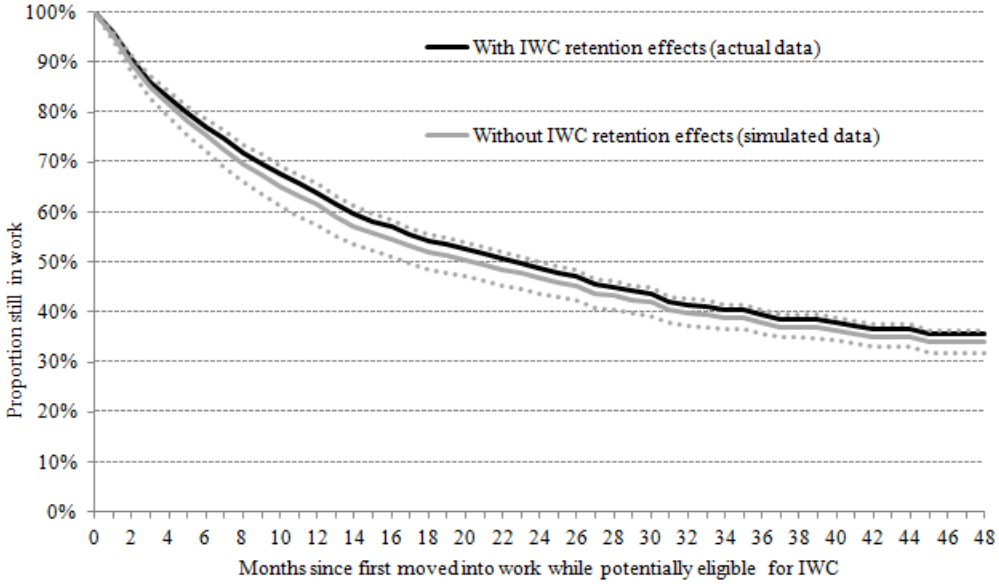
The impact of IWC on job durations can also be seen in Figure 4, which shows the survival curve for remaining in work (of 16 hours or more) for those individuals who entered work while eligible for IWC, as well as the (simulated) estimate of the survival probability of being in work without the retention effects of IWC. In the data, 6 months after moving into work of at least 16 hours and starting to receive IWC, 77.1% of individuals are still in work; in the absence of IWC, only 75.3% are simulated to have remained

Table 5: Impact of IWC on individuals who receive IWC payments

Number of months since first moved into work	Impact of IWC (ppt) on probability of being: On welfare	In part-time work	In full-time work
0	-0.115	0.085	0.032
	[-0.221 , -0.036]	[0.019 , 0.186]	[-0.009 , 0.086]
6	-0.073	0.082	-0.001
	[-0.141 , -0.032]	[0.041 , 0.152]	[-0.028 , 0.037]
12	-0.059	0.075	-0.004
	[-0.116 , -0.027]	[0.043 , 0.129]	[-0.029 , 0.027]
18	-0.044	0.054	0.000
	[-0.090 , -0.020]	[0.029 , 0.100]	[-0.019 , 0.030]
24	-0.034	0.043	0.001
	[-0.074 , -0.016]	[0.021 , 0.082]	[-0.015 , 0.026]
36	-0.033	0.035	0.006
	[-0.068 , -0.015]	[0.014 , 0.065]	[-0.012 , 0.030]

Notes: Policy impacts are calculated using the method described in section 4.3. 95% confidence intervals are shown in brackets below each estimated effect.

Figure 4: Retention effect of IWC: proportion still in work 16+ hours with and without IWC



Source: Sample is those who ever moved into work while potentially eligible for IWC. Simulated outcomes produced as described in section 4.3

in work. After 12 months the equivalent percentages are 64.0% with IWC and 61.5% in the absence of IWC. The difference between the two series does not fall to zero after 12 months: that is, as was shown in Table 4, retention effects remain after the end of the period in which lone parents receive IWC payments.

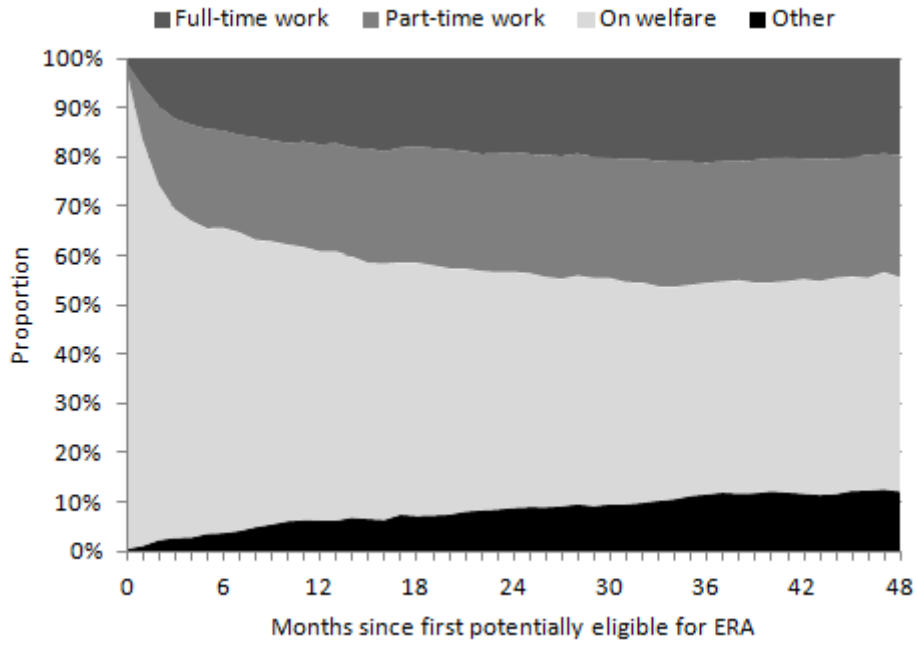
5.3 Estimates of the impact of ERA

5.3.1 The impact of ERA on those who were potentially eligible for the program

We also present the equivalent results on the effect of the ERA program. Figure 5 shows, amongst those who are potentially eligible for ERA, the proportion of individuals in each economic status measured since the time that they are first potentially eligible for ERA. 18 months after the first month of potential eligibility for ERA, 18% of the potentially eligible population were in full-time work, a considerably higher proportion that was found for IWC, and shown in Figure 5.

Table 6 shows the simulated impact of ERA on those potentially eligible for it. Within 6 months of first being potentially eligible, the ERA programs increased full-time work by 5.8 percentage points (an effect which is statistically significant), and it reduced the proportion in part-time work by 0.9 percentage points (also statistically significant): it therefore not only encouraged lone parents to leave welfare for full-time work, but moved some lone parents from part-time work to full-time work. The impact of the program initially rises over time, peaking 24 months after lone parents became eligible to it (ERA payments ended after 24 months of receipt, or 33 months after randomisation), and then falling. However, even 48 months after first be-

Figure 5: Economic activity since first potentially eligible for ERA



Source: Authors' calculations using WPLS; sample of lone parents is those in our sample (as described in 4.2) who were ever potentially eligible for ERA.

ing potentially eligible, the ERA program has still boosted the probabiltiy of being in full-time work by (a significant) 5.3 percentage points. Overall, the impact of ERA is larger than of IWC, despite the lower value (in weekly terms) of the ERA retention payments than IWC (although ERA is available for up to 24 months, whereas IWC payments are paid for at most 12 months).[19]

Tables 7 and 8 split the overall impact of ERA into the welfare-leaving and job retention effects. Unsurprisingly, the initial impact can mostly be attributed to the welfare-leaving effect. Over time, the importance of the welfare-leaving effect falls, and the importance of the job retention effect

[19]The different structure of the programs may also encourage a larger initial response to ERA than IWC, because ERA payments had to stop when the demonstration programs ended, 33 months after joining the programs. Therefore, to get the full amount of payments, lone parents would need to enter full-time work within 9 months of becoming potentially eligible. For IWC, there was no such restriction.

Table 6: Impact of ERA for those potentially eligible on probability of being on welfare or in work

Number of months since first potentially eligible for ERA	Impact of ERA (ppt) on probability of being		
	On welfare	In part-time work	In full-time work
6	-0.045	-0.009	0.058
	[-0.056 , -0.033]	[-0.017 , -0.006]	[0.048 , 0.068]
12	-0.051	-0.017	0.073
	[-0.060 , -0.041]	[-0.027 , -0.011]	[0.062 , 0.086]
18	-0.054	-0.018	0.081
	[-0.063 , -0.043]	[-0.030 , -0.010]	[0.067 , 0.093]
24	-0.057	-0.021	0.087
	[-0.070 , -0.046]	[-0.035 , -0.013]	[0.071 , 0.102]
36	-0.049	-0.018	0.077
	[-0.064 , -0.036]	[-0.033 , -0.010]	[0.057 , 0.092]
48	-0.029	-0.012	0.053
	[-0.044 , -0.019]	[-0.023 , -0.005]	[0.040 , 0.065]

Notes: Policy impacts are calculated using the method described in section 4.3. 95% confidence intervals are shown in brackets below each estimated effect.

rises. For example, 18 months after being eligible for ERA, the job retention effect on the proportion in full-time work (boosting full-time employment by 5.1 ppts) is quantitatively more important than the welfare-leaving effect (+2.9ppts), and this remains so at longer durations. The table also shows that the job retention impact of ERA (significantly) reduces the probability of being in part-time work by 1.8 percentage points after 24 months, implying that the ERA payments discourage lone parents from moving from full- to part time jobs. These retention effects persist, such that 36 months after first becoming potentially eligible (at which point the lone parent is no longer eligible for ERA payments), the retention effects of ERA have significantly increased the proportion in full-time work by 5.4 percentage points.

Table 7: Impact of ERA for those potentially eligible on probability of being on welfare or in work: "Welfare-Leaving" Effect

Number of months since first potentially eligible for ERA	Impact of ERA (ppt) on probability of being		
	On welfare	In part-time work	In full-time work
6	-0.033	-0.004	0.037
	[-0.045, -0.021]	[-0.012, -0.001]	[0.025 0.049]
12	-0.030	-0.005	0.033
	[-0.040, -0.018]	[-0.015, 0.000]	[0.021 0.045]
18	-0.028	-0.003	0.029
	[-0.039, -0.016]	[-0.014, 0.002]	[0.017 0.040]
24	-0.027	-0.003	0.028
	[-0.040, -0.015]	[-0.014, 0.003]	[0.012 0.041]
36	-0.021	-0.003	0.022
	[-0.036, -0.012]	[-0.016, 0.005]	[0.006 0.035]
48	-0.012	-0.002	0.015
	[-0.025, -0.003]	[-0.011, 0.004]	[0.003 0.025]

Notes: Policy impacts are calculated using the method described in section 4.3. 95% confidence intervals are shown in brackets below each estimated effect.

Table 8: Impact of ERA for those potentially eligible on probability of being on welfare or in work: "Retention" Effect

Number of months since first potentially eligible for ERA	Impact of ERA (ppt) on probability of being		
	On welfare	In part-time work	In full-time work
6	-0.012	-0.005	0.021
	[-0.015 , -0.008]	[-0.007 , -0.003]	[0.017 , 0.025]
12	-0.022	-0.012	0.040
	[-0.027 , -0.016]	[-0.015 , -0.009]	[0.035 , 0.047]
18	-0.027	-0.015	0.051
	[-0.034 , -0.022]	[-0.019 , -0.011]	[0.044 , 0.061]
24	-0.030	-0.018	0.059
	[-0.039 , -0.024]	[-0.023 , -0.014]	[0.050 , 0.070]
36	-0.028	-0.015	0.054
	[-0.035 , -0.023]	[-0.020 , -0.010]	[0.046 , 0.064]
48	-0.018	-0.010	0.038
	[-0.025 , -0.016]	[-0.014 , -0.006]	[0.033 , 0.046]

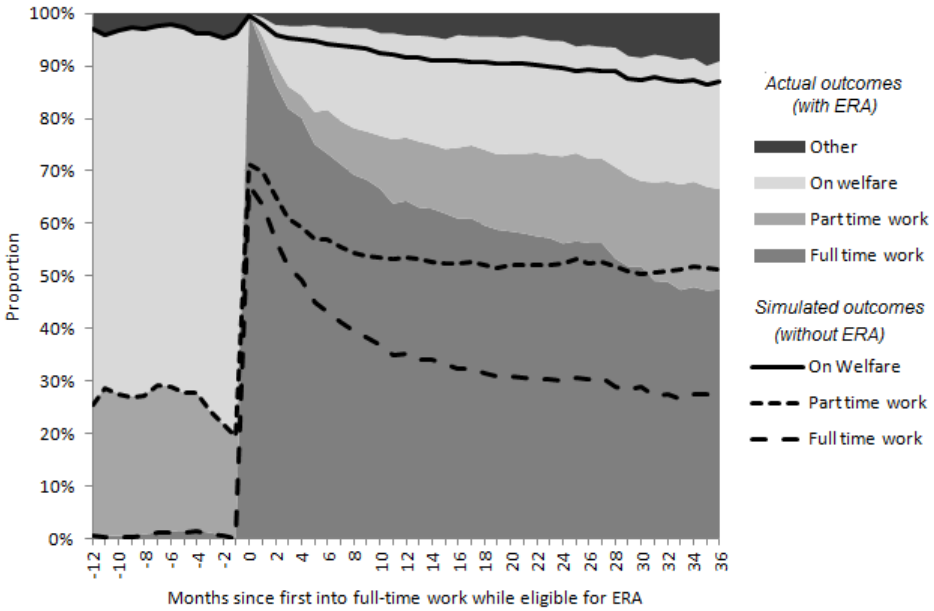
Notes: Policy impacts are calculated using the method described in section 4.3. 95% confidence intervals are shown in brackets below each estimated effect.

5.3.2 The impact of ERA on its recipients

Figure 6 shows the impact of ERA on those individuals who moved into full-time work while potentially eligible for ERA, showing actual outcomes as a stacked area graph, and simulated outcomes in the absence of ERA as a stacked line chart on top. The differences in outcomes - the estimated impact of ERA on its recipients - are summarised in Table 9. This shows that, at the point when ERA recipients moved into full-time work (the first row, labelled "0 months" in the Table), almost 33% of them are simulated to have *not* moved into full-time work at that point in the absence of ERA: this confirms that potential eligibility for ERA had a substantial additional impact on flows from welfare to full-time work. As with IWC, the total impact of ERA on its recipients diminishes over time, partly because some of the 33% simulated to have *not* moved into (full-time) work in the absence of ERA *are* simulated go to move into (full-time) work later, even without ERA; and partly because some of the 33% induced into work by ERA do not remain in work. As with IWC, there, though, is clear evidence that the positive impact of the programs persisted after payments ceased being paid, remaining large and positive 36 months after ERA recipients first moved into work.

The effects of the ERA program on those who receive the payments are explored further in Figure 7, which looks only at the retention effect of ERA on those who moved into full-time work while potentially eligible for ERA. 12 months after having moved into full-time work, 58% were still in work. Our results suggest that in absence of the ERA payments, 19 percent fewer of these lone parents would still be in full-time work. This gap between the proportion persists even after 24 months since initially moving into work, which is the longest time that ERA payments could be claimed for.

Figure 6: Economic activity since moving into full-time work of individuals who received ERA payments



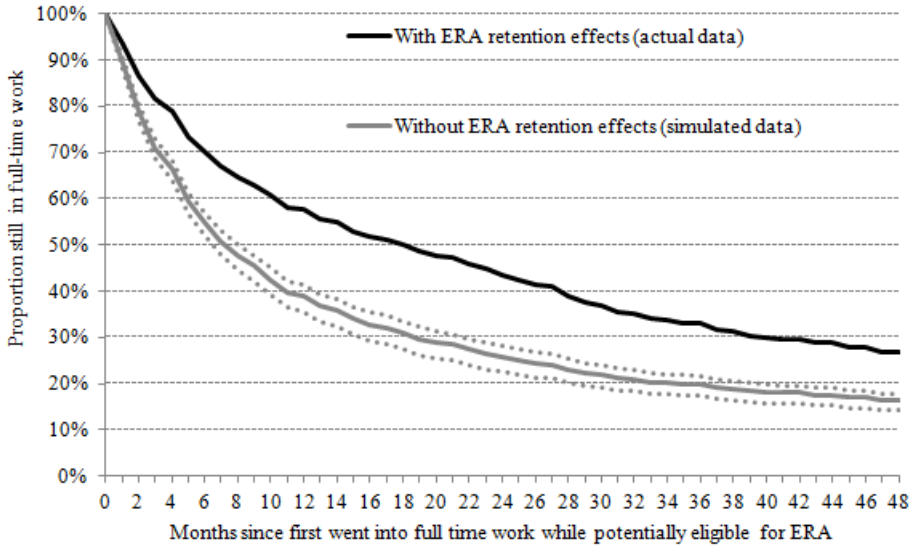
Source: Sample is those who ever moved into full-time work while potentially eligible for ERA. Simulated outcomes are produced as described in section 4.3

Table 9: Impact of ERA on the economic activity of individuals who receive ERA payments

Number of months since first moved into full-time work	Impact of ERA (ppt) on probability of being:		
	On welfare	In part-time work	In full-time work
0	-0.285	-0.038	0.327
	[-0.349 , -0.202]	[-0.079 , -0.012]	[0.241 , 0.402]
6	-0.214	-0.055	0.301
	[-0.257 , -0.166]	[-0.110 , -0.030]	[0.254 , 0.366]
12	-0.187	-0.065	0.292
	[-0.224 , -0.152]	[-0.106 , -0.042]	[0.254 , 0.337]
18	-0.170	-0.062	0.281
	[-0.210 , -0.142]	[-0.102 , -0.039]	[0.242 , 0.322]
24	-0.154	-0.057	0.261
	[-0.194 , -0.122]	[-0.095 , -0.039]	[0.224 , 0.294]
36	-0.114	-0.044	0.197
	[-0.160 , -0.084]	[-0.076 , -0.027]	[0.166 , 0.229]

Notes: Policy impacts are calculated using the method described in section 4.3. 95% confidence intervals are shown in brackets below each estimated effect.

Figure 7: Retention effect on those who moved into full time work while potentially eligible for ERA



Source: Sample is those who ever moved into full-time work while potentially eligible for ERA. Simulated outcomes produced as described in section 4.3

6 Discussion and conclusion

This papers adds to the relatively small literature on the impact of time-limited in-work credits. Such programs have the potential to be considerably cheaper and better targeted than conventional in-work credits, but the previous literature has been pessimistic about the ability of such programs to have long-lasting impacts. We come to different conclusions after studying two different time-limited in-work benefits, piloted in the UK at different times in the 2000s, and targeted at lone parents.

We find that IWC leads to fewer lone parents on welfare and more in (part-time) work, but the effects are small in magnitude and not statistically significantly different from zero. The second program, ERA, leads to large falls in the proportion of eligible lone parents on welfare, and large rises in the proportion in full-time work. For both programs, we decompose the over-

all impact into that due to higher welfare exits, and that due to increased retention in work, and we find that both programs (statistically significantly) increase job retention rates. Moreover, there was also no discernible fallback in employment amongst (former) recipients when payments stopped, in contrast to the findings for related policies in Canada (Card and Hyslop (2005)) and the Netherlands (van der Klauw and van Ours (2013)). We also find that conditioning receipt of the credit on hours of work was an important driver of individuals' responses to the programs. IWC, which was conditional on working 16 or more hours a week, only modestly increased part-time work, with no impact on full-time work. On the other hand, ERA, which was conditional on full-time work, led to significant increases in full-time work that came from having fewer lone parents on welfare and fewer in part-time work.

Considering that the group studied in this paper, lone parents, also have childcare responsibilities and do not have a partner to share those responsibilities with, it may be surprising that the ERA program was so effective at, not only encouraging lone parents to leave welfare for work, but that it encouraged more of them to work full-time and fewer to work part-time. However, this highlights that these individuals respond not only on the extensive but also on the intensive margin. This findings, combined with the fact that the IWC only encouraged a modest increase in part-time work (and had no effect on full-time work), we suggest that the precise eligibility rules are important in determining the programs' impact, and so policymakers should pay particular attention to the kind of work that they want to incentivise when designing such programs in future.

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Appendix

Further details of the IWC and ERA policies

In-Work Credit was rolled out in 6 phases, as listed below (the names refer to the Jobcentre Plus districts; there are around 90 of these districts in Great Britain, and most pilots of welfare-to-work policies operate at the level of the district).

Phase 1 (April 2004): Bradford; North London; South-East London.

Phase 2 (October 2004): Cardiff & Vale; Central London; Dudley & Sandwell; Edinburgh, Lothian & Borders; Lancashire West; Leeds; Leicestershire; Staffordshire; West London.

Phase 3 (April 2005): Brent, Harrow & Hillingdon; City & East London; Lambeth, Southwark & Wandsworth; South London.

Phase 4 (October 2005): Bedfordshire & Hertfordshire; Berkshire, Buckinghamshire & Oxfordshire; Essex; Hampshire & the Isle of Wight; Kent; Surrey & Sussex.

Phase 5 (January 2008): North East London, Birmingham and Solihull.

National roll-out (April 2008): all other parts of Great Britain.

In July 2007, IWC payments were increased to £60 a week in London. The ERA programs was introduced in 6 Jobcentre Plus Districts: South East Wales, Derbyshire, East London, Gateshead, Manchester and Renfrewshire. Randomisation into the ERA programs occurred between December 2003 and January 2005.

Supplementary tables

Table A1: Characteristics of IWC potentially eligible individuals who do and do not move into work, measured at period of first potential eligibility

	Eligible for IWC, **not move** into PT/FT work		Eligible for IWC, **move** into PT/FT work	
Characteristic	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*
Months on welfare (current spell)	52.44	48.14	39.59	37.75
Age	31.88	7.90	31.22	7.48
Age of youngest child	5.70	3.67	5.19	3.45
Local unempl. rate	6.96	1.97	6.26	1.84
Number of children	1.79	0.98	1.68	0.87
IWC Phase area 1	0.07	0.26	0.09	0.29
IWC Phase area 2	0.13	0.34	0.19	0.39
IWC Phase area 3	0.09	0.28	0.10	0.30
IWC Phase area 4	0.17	0.38	0.24	0.42
IWC Phase area 5	0.12	0.33	0.06	0.24
IWC area: national roll out	0.42	0.49	0.32	0.47
Number of individuals	4165		1553	

Source: Sample of lone parents from WPLS as described in section 4.1.

Table A2: Characteristics of ERA potentially eligible individuals who do and do not move into FT work, measured at period of first potential eligibility

	Eligible for ERA, **not move** into FT work		Eligible for ERA, **move** into FT work	
Characteristic	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*
Months in current spell of welfare	43.06	46.01	31.29	41.56
Age	30.82	8.11	31.65	7.69
Age of youngest child	5.38	3.88	5.71	4.10
Unemployment rate	5.62	1.10	5.41	1.61
Number of children	1.65	0.87	1.66	0.84
Number of individuals	998		486	

Source: Sample of lone parents from WPLS as described in section 4.1.

Table A3: Local Unemployment rates in areas where IWC/ERA policies were introduced

Policy stage	Dates	Unemployment rate in eligible areas	Unemployment rate in whole of GB
Prior to IWC programs	May 2003 - Mar 2004	N/A	5.57%
IWC in phase area 1	Apr 2004- Sep 2004	6.35%	5.08%
IWC in phase area 1-2	Oct 2004 - Mar 2005	5.72%	5.14%
IWC in phase areas 1-3	Apr 2005- Sep 2005	6.43%	5.56%
IWC in phase areas 1-4	Oct 2005 - Dec 2007	5.74%	5.66%
IWC in phase areas 1-5	Jan 2008 - Mar 2008	6.32%	6.18%
IWC available in all GB	April 2008 - Dec 2009	N/A	7.79%
ERA programs	Oct 2003 - Jan 2005	5.78%	5.18%

Source: Unemployment rates measured at the "Travel to Work Area" and available at www.nomisweb.co.uk.

Table A4: Results from multi-state multi-spell duration model

	Coefficient	Standard Error
Welfare to part-time work (interrupted)		
Potentially eligible for IWC next month	0.027	0.067
Potentially eligible for IWC next month (and in London post July 2007)	0.231	0.225
Duration in current spell	-0.012	0.002
Duration squared	0.000	0.000
Duration over 12 months (dummy)	0.147	0.069
Age	0.006	0.004
Number of children	-0.076	0.028
Age of youngest child	0.030	0.008
Local unemployment rate	-0.030	0.018
Female	1.570	0.157
White	-0.033	0.060
Constant	-5.486	0.344
Additional constant if type B	2.207	0.074
Welfare to full-time work (interrupted)		
Potentially eligible for IWC next month	-0.149	0.097
Potentially eligible for IWC next month (and in London post July 2007)	0.345	0.270
Potentially eligible for ERA next month	0.514	0.084
Duration in current spell	-0.017	0.003
Duration squared	0.000	0.000
Duration over 12 months (dummy)	-0.052	0.091
Age	0.001	0.005
Number of children	-0.163	0.038
Age of youngest child	0.067	0.010
Local unemployment rate	-0.040	0.025
Female	0.034	0.125
White	-0.353	0.073
Constant	-3.323	0.445
Additional constant if type B	2.180	0.100
Welfare to "None of the above" (interrupted)		
Duration in current spell	-0.014	0.002
Duration squared	0.000	0.000
Duration over 12 months (dummy)	-0.042	0.091
Age	-0.016	0.005
Number of children	0.099	0.030
Age of youngest child	0.010	0.010
Local unemployment rate	-0.017	0.021
Female	-0.383	0.123
White	-0.037	0.068
Constant	-2.445	0.437
Additional constant if type B	-1.248	0.257

	Coefficient	Standard Error
Welfare to part-time work (fresh)		
Potentially eligible for IWC next month	0.243	0.112
Potentially eligible for IWC next month (and in London post July 2007)	0.459	0.230
First month in current spell	-0.630	0.127
Duration in current spell	-0.055	0.013
Duration squared	0.001	0.000
Duration over 12 months (dummy)	0.008	0.135
Age	0.001	0.005
Number of children	-0.117	0.037
Age of youngest child	0.028	0.011
Local unemployment rate	0.005	0.022
Female	0.870	0.228
White	-0.095	0.081
Constant	-4.205	0.609
Welfare to full-time work (fresh)		
Potentially eligible for IWC next month	0.237	0.166
Potentially eligible for IWC next month (and in London post July 2007)	-0.066	0.317
Potentially eligible for ERA next month	0.090	0.133
First month in current spell	-0.434	0.154
Duration in current spell	-0.067	0.018
Duration squared	0.001	0.000
Duration over 12 months (dummy)	0.006	0.191
Age	-0.003	0.007
Number of children	-0.174	0.053
Age of youngest child	0.024	0.014
Local unemployment rate	-0.007	0.033
Female	-0.801	0.162
White	-0.522	0.100
Constant	-1.056	0.840
Additional constant if type B	1.361	0.144
Welfare to "None of the above" (fresh)		
First month in current spell	-0.617	0.168
Duration in current spell	-0.042	0.016
Duration squared	0.000	0.000
Duration over 12 months (dummy)	0.033	0.159
Age	-0.010	0.007
Number of children	-0.076	0.045
Age of youngest child	-0.001	0.014
Local unemployment rate	-0.002	0.027
Female	-0.792	0.173
White	-0.082	0.101
Constant	-2.432	0.581
Additional constant if type B	-1.767	0.181

	Coefficient	Standard Error
Part-time work to welfare		
In receipt of IWC	-0.151	0.073
In receipt of IWC	-0.089	0.192
(and in London post July 2007)		
First period in current spell	0.077	0.084
Duration in current spell	-0.078	0.007
Duration squared	0.001	0.000
Age	-0.012	0.005
Number of children	-0.024	0.034
Age of youngest child	-0.053	0.010
Local unemployment rate	0.018	0.020
Female	-0.480	0.209
White	0.169	0.069
Constant	-1.613	0.469
Additional constant if type B	-0.098	0.093
Part-time work to full-time work		
In receipt of IWC	-0.398	0.149
In receipt of IWC	-0.137	0.378
(and in London post July 2007)		
Potentially eligible for ERA next month	0.121	0.115
First period in current spell	-0.001	0.134
Duration in current spell	-0.036	0.009
Duration squared	0.000	0.000
Age	-0.015	0.006
Number of children	0.022	0.044
Age of youngest child	0.040	0.013
Local unemployment rate	-0.003	0.027
Female	-0.442	0.261
White	-0.307	0.084
Constant	-2.508	0.713
Additional constant if type B	0.697	0.132
Part-time work to "None of the above"		
In receipt of IWC	-0.151	0.073
In receipt of IWC	-0.089	0.192
(and in London post July 2007)		
First period in current spell	0.031	0.107
Duration in current spell	-0.047	0.008
Duration squared	0.000	0.000
Age	-0.024	0.006
Number of children	0.005	0.039
Age of youngest child	-0.014	0.011
Local unemployment rate	-0.026	0.022
Female	0.008	0.309
White	0.034	0.077
Constant	-1.000	0.586
Additional constant if type B	-0.305	0.098

	Coefficient	Standard Error
Full-time work to welfare		
In receipt of IWC	0.034	0.111
In receipt of IWC	0.274	0.247
(and in London post July 2007)		
In receipt of ERA	-0.913	0.111
First period in current spell	0.004	0.117
Duration in current spell	-0.086	0.010
Duration squared	0.001	0.000
Age	-0.011	0.007
Number of children	-0.050	0.049
Age of youngest child	-0.071	0.013
Local unemployment rate	0.025	0.029
Female	-0.684	0.132
White	0.126	0.088
Constant	-2.915	0.629
Additional constant if type B	0.002	0.125
Full-time work to part-time work		
In receipt of IWC	0.010	0.180
In receipt of IWC	0.061	0.407
(and in London post July 2007)		
In receipt of ERA	-1.000	0.184
First period in current spell	0.092	0.155
Duration in current spell	-0.030	0.012
Duration squared	0.000	0.000
Age	-0.010	0.008
Number of children	0.061	0.054
Age of youngest child	-0.038	0.015
Local unemployment rate	0.014	0.032
Female	0.942	0.297
White	-0.143	0.097
Constant	-4.926	0.872
Additional constant if type B	0.667	0.170
Full-time work to "None of the above"		
In receipt of IWC	0.034	0.111
In receipt of IWC	0.274	0.247
(and in London post July 2007)		
In receipt of ERA	-0.913	0.111
First period in current spell	-0.079	0.155
Duration in current spell	-0.054	0.012
Duration squared	0.000	0.000
Age	-0.030	0.008
Number of children	0.071	0.055
Age of youngest child	-0.015	0.015
Local unemployment rate	-0.020	0.033
Female	-0.227	0.188
White	-0.061	0.099
Constant	-1.813	0.811
Additional constant if type B	-0.182	0.130

	Coefficient	Standard Error
"None of the above" to welfare		
First period in current spell	1.127	0.071
Duration in current spell	-0.100	0.010
Duration squared	0.001	0.000
Age	0.003	0.005
Number of children	-0.144	0.033
Age of youngest child	-0.052	0.010
Local unemployment rate	-0.005	0.020
Female	-0.359	0.122
White	0.097	0.068
Constant	-1.393	0.471
Additional constant if type B	1.387	0.120
"None of the above" to part-time work		
First period in current spell	0.883	0.120
Duration in current spell	-0.022	0.016
Duration squared	0.000	0.000
Age	-0.001	0.008
Number of children	-0.157	0.059
Age of youngest child	0.020	0.016
Local unemployment rate	-0.078	0.033
Female	2.020	0.511
White	0.093	0.116
Constant	-6.480	0.937
Additional constant if type B	2.397	0.143
"None of the above" to full-time work		
Potentially eligible for ERA next month	-0.149	0.215
First period in current spell	0.687	0.153
Duration in current spell	-0.072	0.021
Duration squared	0.002	0.000
Age	0.018	0.011
Number of children	-0.093	0.074
Age of youngest child	0.010	0.021
Local unemployment rate	-0.126	0.049
Female	-0.275	0.256
White	-0.255	0.144
Constant	-3.382	1.126
Additional constant if type B	-1.248	0.257
Probability of Type A	0.649	
Probability of Type B	0.351	

Notes: Regressors included in estimation but omitted from the table are: area dummies for each IWC phase area, dummy for being in the ERA areas, dummy for being in the ERA areas but not in the ERA treatment or control groups, calendar time (linear and quadratic terms), and time dummies for each IWC phase area, a dummy for being in London, and a dummy for being in London after July 2007. Estimation method described in Section 4.3.