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Can't work or won't work: Quasi-experimental evidence on work search requirements for single parents☆

Silvia Avram[a], Mike Brewer[a,b], Andrea Salvatori[a,c,*]

[a] University of Essex, Colchester UK
[b] Institute for Fiscal Studies, London, UK
[c] Organisation of Economic Co-operation and Development (OECD), Paris, France

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ABSTRACT

Increasing the labour market participation of single parents, whether to boost incomes or reduce welfare spending, is a major policy objective in a number of countries. This paper presents causal evidence on the impact of work search requirements on single parents' transitions into work and onto other benefits. We use rich administrative data on all single parent welfare recipients, and apply a difference-in-differences approach that exploits the staggered roll-out of a reform in the UK that gradually decreased the age of the youngest child at which single parents lose the right to an unconditional cash benefit. Consistent with the predictions of a simple search model, the work search requirements have heterogeneous impacts, leading some single parents to move into work, but leading some (especially those with weak previous labour market attachments) to move onto disability benefits (with no search conditionalities) or non-claimant unemployment.

1. Introduction

Over the past twenty years, several countries have extended to single parents various activation policies which are commonly directed at the unemployed at large (for reviews and discussion of active labour market policies, see OECD, 2007; Bergemann and van den Berg, 2008; Eichhorst and Konle-Seidl, 2008; Immervoll and Scarpetta, 2012; Card et al., 2015; Brown and Koetti, 2015; Eichhorst and Konle-Seidl, 2016). One central element of these policies is the imposition of work search requirements for single parents who claim benefits, with the aim of increasing the flow into employment. Previous work has shown that work search requirements might induce individuals with low level of labour market attachment to give up search entirely and join the ranks of those not in employment nor on benefits (Manning, 2009; Petrongolo, 2009). This casts doubt on the effectiveness of search conditionalities for single parents, a socio-demographic group that tends to have low levels of labour market participation.

In this paper, we present new causal evidence on the impact of the introduction of work search requirements on the probability of welfare-receiving single parents moving off welfare and into work. We exploit the staggered roll-out of a reform recently implemented in the UK, and known as "Lone Parents Obligations" (LPO). In a series of discrete jumps, the reform gradually lowered the age of the youngest child which triggers a move from a regime of unconditional income support to a regime with work search requirements. We use a difference-in-differences setting with rich administrative data on benefit receipt and spells of employment, using single parents with younger children as an unaffected group, and using a long span of pre-reform data on single parents with similarly-aged children. The staggered nature of this roll-out – which effectively means we study not just one but a series of reforms affecting different groups at different times – provides reassurance that our results are not due to a time-varying shock differentially affecting the treatment or comparison groups. The large and rich administrative data means we pay particular attention to heterogeneous treatment effects. We find that work search conditionalities increased the flow of single parents into work, but also caused a large proportion of single mothers to move onto health-related benefits or into non-claimant unemployment. The nature of this response is related to previous labour market experience in ways that are consistent with standard models of job search.

Our research contributes to the literature examining the impact of passive or active labour market policies for single parents, and to the literature estimating the impact of work search requirements for the

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* Corresponding author at: OECD, 2 rue Andre Pascal, 75016 Paris, France.
E-mail address: andrea.salvatori@oecd.org (A. Salvatori).

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unemployed or those on social assistance. The literature on single parents concludes that broad activation policies that have included work search requirements reduce the benefit count, increase employment and reduce poverty among single parents.[1] But there is also evidence that the effects of such reforms are heterogeneous and some single parents are made worse off. In the US, for example, welfare reforms are thought to have led to a substantial increase in the proportion of "disconnected" single mothers who are not in work nor on benefits (Blank, 2007). But the comprehensive nature of the reforms evaluated in this literature makes it difficult to disentangle the effects of the individual provisions: the 1996 US reform, which has been the subject of a large number of studies, simultaneously introduced time limits, work search requirements and sanctions (Moffitt, 2008), as well as giving states considerable discretion in designing the welfare system. An important feature of the UK reform, and therefore an important contribution of our study, is that it allows us to focus on effects of work search requirements (backed up with the threat of sanctions) separately from other changes to the benefit, tax credit or welfare-to-work system. There is also a much smaller literature on the impact of activating recipients of social assistance benefits, which in many European countries have traditionally been "inactive" benefits (unlike unemployment insurance benefits). For example, Brodersen (2015) examines the impact of fortnightly meetings with case workers for social assistance recipients in Denmark, Dahlberg et al. (2009) examines the impact of activating welfare recipients in Stockholm, and Bolvig et al. (2003) estimates the impact of different sorts of activation policies for welfare recipients in Aarhus. Comparing the results of these studies to each other and to our own, though, is difficult, in part because there is considerable heterogeneity not just in what was involved by activation, but also by the composition of those receiving social assistance benefits.

The literature estimating the impact of work search requirements for the unemployed is too large for us to summarise, but two very relevant studies are Manning (2009) and Petrongolo (2009), which both study the introduction of work search requirements for the unemployed in the UK (with the introduction of Jobseeker's Allowance (JSA) in 1996). Both studies find the JSA reform to have moved people off unemployment benefits, but not into work, with large flows into non-claimant unemployment and benefits for those with disabilities or poor health (we call these "health-related benefits" hereafter). These findings are consistent with a simple search model that predicts that some claimants might find the search requirements too burdensome and give up search entirely. As Manning (2009) shows, this is likely to be the case for individuals with initial low level of search, for whom the marginal cost of the extra search effort might exceed the expected benefit. And there are plausible reasons to think that single parents might be disproportionately found in this group. For example, single parents may have lower expected returns compared to the typical unemployed for given search effort, due to the longer average duration of their jobless spells (which might lower both the probability of an offer being made and the wage offered), or because, for a given job offer rate, they will accept only jobs with flexible arrangements or part-time hours that allow them to manage their childcare duties. If this is the case, the additional work search requirements could induce a significant flow towards benefits with no search conditionalities or towards non-claimant unemployment.[2] Hence, both the literature on the impact of comprehensive activation policies on single parents and that on the impact of work search requirements on the unemployed at large suggest that introduction of search conditionalities for single parents might not achieve the intended aim of increasing labour market participation for this group.

We contribute to this issue by studying a reform that gradually reduced, from 16 to 7, the age of the youngest child at which a single parent loses her (or his, but we use female pronouns throughout) entitlement to the unconditional income support benefit (a further extension to age 5 took place in a period not covered by our data). The intention was that, once the youngest child had reached this age, single parents that wanted to receive welfare benefits would have to claim the unemployment benefit, although they could also claim health-related benefits if they met the medical conditions. The unemployment benefit, known as Jobseekers Allowance (JSA), can be claimed indefinitely (subject to a means-test on income and financial assets), but claimants are required to look for work actively, report to a welfare office at least fortnightly, and, like most "active" benefits, can be sanctioned for not making sufficient efforts to look for work, or for turning down job offers without good reason.[3] There were no other differences between the unconditional income support benefit and the unemployment benefit: both are administered by the same agency and a family's entitlements to both should be identical.

We show that the introduction of work search conditionalities did increase the flow of single parents into work, but also caused a large proportion of single mothers to move onto health-related benefits or into non-claimant unemployment (in the sense that they are not observed either in work or on benefits in our dataset). In fact, the flow towards either of the two states with no work search requirements attached is generally larger than that into work. For example, nine months after the loss of entitlement to the unconditional income support, the reform has increased the probability that a previously welfare-receiving single parent is in work by about 10pp, but has also increased the probability of receiving either health-related benefits or being in non-claimant unemployment by about 18pp. The nature of this response is related to previous labour market experience: those with lower labour market attachment (proxied for by the fraction of time a single parent has spent on welfare benefits before being affected by the reform) are more likely to move into non-claimant unemployment and particularly onto health-related benefits, than those with stronger labour market attachment. Point estimates suggest that lone parents with low labour market attachment were also more likely to move into work, but the differences by previous labour market attachment are not statistically significant. That the impact of work search requirements might vary with the work-readiness of the single parents is consistent with the search model of Manning (2009) and Petrongolo (2009), and our empirical findings echo the one of an increase in the proportion of "detached" mothers found in the US (Blank, 2007), although we are not able to examine the reform's impact on incomes or poverty. Our findings also, there-

[1] See Moffitt (2008) for a review of the evidence for the US, but also Fok and McVicar (2013) and Gong and Breunig (2014), who study a reform similar to LPO in Australia, Mogstad and Pronzato (2012) who study a related reform from Norway, and Knoef and van Ours (2016) for 2 reforms in the Netherlands. Dolton and Smith (2011) examine an earlier UK reform (known as "New Deal for Lone Parents", or NDLP) in the UK that introduced a voluntary programme of work search counselling, and use the same administrative data on benefit receipt as we do, except that their data predates the existence of tax credits, from which we draw our measure of employment. Blundell et al. (2014) briefly considers the impact of reform we study on single parents' employment rates, but their analysis identifies the impact of LPO from deviations from a linear time trend in employment rates, with no explicit comparison group to net out common labour market shocks, and without considering the precise rules determining when individual single parents were affected.

[2] Some of these alternative benefits might bear initial take-up costs that are greater than those for the unconditional income support. For example, health-related benefits might require medical examinations. By introducing search requirements for lone parents, the reform lowers the relative up-front cost of taking up health-related benefits (Reiso 2014).

[3] There is an extensive literature that seeks to estimate the causal impact of being sanctioned, or the causal impact of receiving unemployment benefits under a sanctioning regime (for example, see: Arni et al., 2015; Lalive et al., 2008; Rosholm and Svarer, 2008; Abbring et al., 2005). An important feature of the JSA regime in the UK is that claimants are required to undertake work search and related activities, and can be sanctioned if they do not comply with the terms of their "jobseeker's agreement", and so part of the impact of the LPO reform could be due to the act of being sanctioned, or the threat of being sanctioned. However, we lack data on who is sanctioned, and so we cannot contribute directly to this literature (Appendix C documents that about 3-5 percent of lone parents receiving JSA were sanctioned in each month, with sanctions typically lasting 1, 2, or 4 weeks); instead, our results should be seen as the overall impact of moving single parents to a regime where they are required to attend fortnightly meetings and undertake work search activities, backed up by the threat of sanctions.

fore, contribute to the literature that documents important interactions between (or substitutions between) programmes to support those with poor health (such as the DI programme in the US) and programmes to support the unemployed: in addition to works already cited, see also, for example, Lammers et al. (2013), Reiso (2014) (who also finds that activation reforms for single parents induced a significant flow towards health-related benefits), Brodersen (2015), and Lindner (2016) for recent empirical evidence, and Lawson (2015) for an assessment for how this affects the optimal design of UI. We discuss in Section 5 the relationship between our findings and the literature on how in-work benefits affect lone parents' employment.[4]

The rest of the paper is arranged as follows. Section 2 explains the reform. Section 3 describes our empirical approach, while Section 4 described the data and gives a descriptive overview of the outcomes of the single parents affected by the reform. Section 5 presents our estimates of the impact of the reform, and Section 6 concludes.

2. The introduction of work search requirements on single parents in the UK: the LPO reform

The UK is the OECD country with the highest share of families headed by a sole parent (25.9% in 2004, and the highest proportion of children living in such families (24.1% in 2004, (OECD, 2011)). Furthermore, at the time this reform was being debated, the employment of single parents in the UK was considerably lower than the OECD average, and the poverty rate considerably high, facts that OECD (2011) attributes to the inability of the (pre-reform) income support system to alleviate poverty among non-working single parents.[5]

It was this context that led to the Lone Parent Obligations (LPO) reform, which effectively introduced work search requirements for single parents who claim welfare benefits.[6] It did this by gradually reducing from 16 to 5 the age of the youngest child at which a single parent loses her entitlement to the unconditional income support benefit (known as Income Support, or IS). To maintain the same level of income after IS runs out, single parents would then need to claim the benefit for the unemployed (known as Jobseeker's Allowance (JSA)), and be subject to the same work search requirements as any other unemployed claimant. Importantly, there are no major differences between the unconditional income support benefit and the unemployment benefit except that the latter requires recipients to undertake job search activities: both programmes are administered by the same agency, and the size of payment to which a family is entitlement should be the same for both because the design of the means-tests is identical. Alternatively, single parents who satisfied the eligibility conditions could claim a benefit intended for those deemed unable to work through ill-health or disability (we call these "health-related benefits"; the main one in the period we study was called Employment and Support Allowance (ESA)). Single parents' entitlement to other welfare benefits or tax credits, such as the Child Tax Credit, Housing Benefit and Council Tax Benefit, was unaffected by LPO. Single parents who move into work of at least 16 h a week were able to claim in-work tax credits; this was also unaffected by the LPO reform. Before the reform's introduction, the UK government expect it to lead to net fiscal savings, with the additional tax revenues from working lone parents plus the reduction in spending on benefits and tax credits reaching £150–300 m in its first three years (para 8 of DWP (2007)).

Hence, following the reform, as their youngest child reached a certain age, single parents who were not in work of at least 16 hours a week had a choice between claiming unemployment benefits subject to standard work search requirements (backed up with the threat of sanctions), claiming health-related benefits if they were in sufficiently poor health or disabled, or accepting a significant reduction in their income (in 2009–10, a single parent with one (two) child(ren) that did not receive any of IS, JSA or ESA would be entitled to £3820 (£6741) a year from child benefit and child tax credit. IS or JSA would add a further £3344. Foregoing IS or JSA therefore means a reduction in income of 47% (33%) for a single parent with 1 (2) child(ren).[7] A small number of single parents were exempt from LPO, meaning that they could continue to claim the unconditional IS: these were single parents who were the designated full-time Carer of a disabled person, single parents who had a child who is severely disabled, and those who were fostering children (our data allow us to identify only the first of these, and we exclude such single parents from our analysis sample).

The LPO policy was phased in between November 2008 and late 2012. In this period, the age of the youngest child at which a single parent lost her entitlement to IS fell in a series of discrete jumps (Appendix A provides the precise information on the dates on which single parents lost entitlement to IS according to the date of birth of their youngest child). Officially, each of these discrete jumps was called a sub-phase, and these sub-phases were grouped into several Phases. The data available to us allows us to estimate the impact of LPO on single parents whose youngest child was between 16 and 7, covering Phases 1 to 3; we do not have data covering the period where single parents whose youngest child was aged 5 to 7 were affected by the reform.

3. Empirical strategy

3.1. Empirical strategy

Our aim is to estimate the impact of LPO on single parents who were existing claimants of the unconditional income support benefit (IS), and to estimate how LPO changed their subsequent employment and welfare receipt.[8] We do this with a difference-in-differences design, where we observe outcomes for single parents with older children (the treatment group) and with younger children (the comparison group), and who are drawn from one of six cohorts spanning a 8 year period, the last of which is affected by LPO, and the first five of which are observed before LPO. We explain below precisely how these were constructed, and our approach to inference.

3.1.1. Constructing the treatment and comparison groups

For each sub-phase, the treated group is made up of the single parents whose youngest child's date of birth falls into various windows, as set out in Appendix A. We then assume that the LPO policy regime could have affected lone parent's behavior beginning from 12 months before the loss of entitlement to IS, and so our treated group for each sub-phase is defined as single parents whose youngest child was born in a particular window, as set out in Appendix A, and who were receiving IS 12 months before the projected date on which they would lose entitlement to IS. Single parents were officially notified of their loss of entitlement to IS with 12 months' notice, and received more frequent counselling

[4] See Brewer et al. (2006), Francesconi and van der Klaauw (2007), and Gregg et al. (2009) for UK evidence, and Nicols and Rothstein (2016) for a review of US evidence.

[5] The employment rate of single parents in the mid 2000s was 56%, compared with 71% for mothers living with or married to a partner; the proportion of individuals from lone parent families with less than 60% of the median equivalised income was 50% in 2006-2008, compared with 23% for those in two-parent families with children (employment rates from ONS analysis at http://tinyurl.com/j7k4nsu; poverty rates from http://www.poverty.org.uk/05/index.shtml).

[6] The LPO policy reform could be classified either as "work search assistance", or as "threat/sanctions" in Card et al.'s classification; and has elements of the "activation and workfare", "sanctions", "work search assistance" and "counselling and monitoring" categories in the Brown and Koetti classification.

[7] Separate benefits are available to cover the cost of rental housing and local property taxes. Benefit rates are taken from http://www.ifs.org.uk/tools_and_resources/fiscal_facts/.

[8] We do not look at how the reform affected on-flows to welfare from those previously not receiving welfare. Although we observe the universe of welfare claims, we do not know how many lone parents there are in the population with children of different ages, and so we could not tell whether a change in the number of new claims of welfare was a change in the rate of new claims.

meetings with their Case Worker (although without any work search requirements) in the 12 months leading up to the loss of entitlement. Our approach therefore counts this period as part of the LPO treatment (we have no direct information on single parents' awareness of the reform as in, for example, van den Berg et al. (2009)). However, some single parents in our treated sample might not actually have been affected by LPO when the time came for them to lose entitlement to IS, either because their entitlement to IS had been extended (most usually because they had another child), or because they had stopped receiving IS.

We then define an observation window that lasts 36 months from this date (i.e. the observation window begins 12 months before and ends 24 months after the date on which they were projected to lose entitlement to IS), or until 30 September 2011, when our data is right-censored. For example, a single parent with a youngest child born between 1 February 1999 and 26 October 1999 would be in sub-phase 2aF, and would have lost entitlement to IS between 25 October 2010 and 25 October 2011 (on a date that depended on the child's precise birth date).

For each sub-phase, the comparison group was defined as single parents whose youngest child turns 4 during the window of calendar time in which the treated single parents lost entitlement to IS. For example, the comparison group for sub-phase 2aF is made up of single parents whose youngest child turns 4 between 25 October 2010 and 25 October 2011. This is the oldest age that we can choose for the comparison group's youngest children whilst ensuring that they are unaffected by LPO during the full observation window.[9] As with the treatment group, the observation period for the comparison group starts 12 months before this date, so it begins on the third birthday of the youngest child, and ends on the sixth birthday of their youngest child, or on 30 September 2011.

We then produce equivalent pre-reform cohorts of the treated and comparison groups by selecting single parents whose youngest children were the same age as the actual treated and comparison group and whose birthday fell in the same months of the year, but in earlier years. (This is equivalent to following the rules above for constructing the treatment and comparison groups, but pretending that LPO was introduced in earlier years). To ensure that all of our pre-reform cohorts are unaffected by LPO throughout their 36 month observation window, the latest pre-reform cohort is selected to be 4 years earlier than the actual treated group; additional pre-reform cohorts are drawn from earlier years. The constraints that our data is available only from summer 1999 and that in our regressions we control for the amount of time spent on benefits or work in the 36 months before the start of the observation period mean that we can use at most 5 cohorts from the pre-reform period. For example, for the treated group that includes single parents whose youngest child turned 11 between 25 October 2010 and 25 October 2011, the latest pre-reform cohort includes single parents whose youngest child turned 11 between 25 October 2006 and 25 October 2007; the next pre-reform cohort between 25 October 2005 and 25 October 2006, and so forth, and we do the same for the comparison group. Finally, we drop all single parents who were receiving Carer's Allowance at the start of the observation window, as this group was exempt from the LPO reform, and those aged over 57 at the start of the window (as these women would become entitled to a state pension payments during the observation window).

One possible objection to our design is that a standard dynamic labour supply model would predict individuals would respond as soon as they realise that LPO reform means that their entitlement to income support will end earlier than they had anticipated. In theory, this would mean that we could not rule out that the reform had an impact on the comparison group in the post-reform period (and any such response would likely result in our estimates being downwardly biased). Our design does not allow us to test this directly, but we find it implausible that any such response would be of a meaningful magnitude, given that this is likely to be a myopic, credit constrained population, and that our estimated impacts for Phase 1 – where the comparison group are the furthest away in time from losing their entitlement to benefits – show very impacts 9 months before the loss of entitlement that are insignificantly different from zero.

3.1.2. Empirical specification and inference

We apply the two-step procedure suggested in Donald and Lang (2007) to produce coefficient estimates and p-values. If we think of a group as being defined by the interaction of cohort dummies with an indicator for being in the treatment group, then this addresses the twin problems that our variable of interest is constant within a group, and that we have relatively few groups (we have at most 12).

In the first step, we partial-out the individual-level covariates by running the following equation on the full micro-data:

$$y_{i(g)} = X_i\zeta + \sum_{g=1}^{12} \delta_g I_g + \in_i \quad (1)$$

where I_g is an indicator variable for individual i belonging to group g, and X_i is a vector of individual-level controls.

In the second step, the dependent variable is the set of estimated group coefficients, $\hat{\delta}_g$, and these are regressed on cohort dummies, I_c, a treatment group dummy, and the interaction of the treatment group dummy with being in the final, post-reform, cohort (with β_2 being the coefficient of interest):

$$\delta_g = \sum_{c=1}^{6} \gamma_i I_c + \beta_1 Treatment_g + \beta_2 Treatment_g * I(c=6) + u_g. \quad (2)$$

Following Donald and Lang (2007), inference in this second step is carried out using the t-distribution with 4 degrees of freedom.[10] This approach should ensure that the true size of the tests is close to the nominal size if there is no dependence between the 12 clusters. The vector X_i includes the individual-level variables (age and gender of single parent, number of children, ethnicity of single parent, whether the single parent suffers from ill health or a disability, and summary measures of past employment and welfare receipt) and geographical variables which should control for time-invariant differences in local labour markets, as well as time-varying differences either due to changing labour markets or to any changes in the policy of local employment offices.[11]

As outcomes, we use "in employment" and receipt of various welfare benefits intended for non-working recipients, measured at 6 month intervals, beginning 9 months before the date of the predicted loss of entitlement to IS (or 3 months after the sample is drawn), and with a final outcome measured 24 months after the predicted loss of entitlement to IS (36 months after the sample is drawn). Eqs. (1) and (2) are estimated separately for each outcome, and for each sub-phase of LPO, by OLS. To help summarise the results, we also estimate a variant that pools all the sub-phase samples for each of the 3 main Phases, and we estimate a variant of (2) that allows for separate linear trends in the treatment and comparison groups.

[9] We also checked the robustness of our results to using a control group with the youngest child aged 5 and reducing the observation period to 2 years. The results, not reported here, are in line with those included in this paper.

[10] There are 12 data points and 8 coefficients. We do not make any allowance for estimation error in the first step; Table 1 shows the size of the post-reform treated groups in each sub-phase, the smallest of which has over 7,000 observations. Figs. 2–4 show a considerable degree of stability in the estimates of the pre-reform differences between outcomes for the treatment and comparison group, which suggests that sampling error in the set of $\hat{\delta}_g$ coefficents is negligible.

[11] We included: indicator variables for each travel-to-work area; a measure of the relative deprivation or affluence of the single parent's area of residence (this was the ward-level rank of the Index of Multiple Deprivation, measured separately for England and Wales, plus an indicator for being in Scotland); a set of indicator variables for each Jobcentre Plus district interacted with cohort.) It is possible that the impact of the reform might vary across areas depending on the availability of childcare, particularly for parents whose youngest child is under 13, but we do not know of good data measuring the geographical variation in the availability or price of childcare for school-age children in the UK.

3.1.3. Threats to internal validity

We rely on the three standard assumptions of the DiD approach for the coefficient β_2 to give unbiased estimates of the impact of LPO. First, we assume that single parents with younger and older children share a common trend in the absence of the treatment. This could be violated if other policy changes at the same time as LPO affected the two groups of single parents differentially. We provide details on potentially relevant policy changes (not necessarily specifically aimed at single parents) in Appendix B: we do not believe that other policy changes could have significantly altered the difference in outcomes between single parents with older and younger children. In Section 5.1, we provide evidence in support of the common trend assumption by showing that the difference between the treatment and comparison groups in the 5 pre-reform cohorts is remarkably stable over time. Additionally, the staggered roll-out of the reforms we exploit enables us to estimate the impact of the introduction of the work search requirements at different points in calendar time, hence providing reassurance that our results are not driven by a shock at a particular time differentially affecting the treatment or comparison groups. However, as a robustness check, we estimate a variant that allows outcomes in treatment and comparison groups to have their own linear trends.

The second assumption is that the composition of the treatment and comparison group does not change over time in a way that could confound the estimate of the effect of interest. Given the limited time span covered by our data, there are good reasons to believe the homogeneity of these groups over time. We show in Tables 2–4 that the treatment and comparison groups appear very similar in terms of observed characteristics over time (and the inclusion of controls for employment and welfare receipt histories can be thought of as acting as a proxy for relevant unobservable, as in Card and Sullivan (1988) and Petrongolo (2009)).

A third assumption is that the comparison group are not themselves affected by the treatment. We defined the comparison group deliberately so that they would not be potentially affected by LPO throughout the three-year window (i.e. that the date on which they would lose eligibility to income support was at least a year after the end of the three year observation window). It is possible that the single parents in the comparison group could have been affected through substitution or displacement effects due to increased search effort by the single parents in the treatment group, which would likely result in an upward bias in the estimate of the impact of the reform on the probability of moving into work.We cannot estimate these effects, but we consider that they are unlikely to be large.

4. Data and descriptive statistics

4.1. Overview

We use an administrative dataset provided by the UK's Department for Work and Pensions (DWP), and known as the Work and Pensions Longitudinal Study (WPLS). This combines information collected by DWP for administering benefit claims and welfare-to-work programmes with information about employment, earnings and tax credit claims collected by the tax authority (HM Revenue and Customs). This data is matched at the individual level, using a combination of name, date of birth, address and social security number. the advantage of this dataset is the very large number of observations, the ability to identify precisely when a single parent is due to lose entitlement to IS, and the ability to track accurately flows between different government programmes. The version of the dataset we used comprised a 100% sample of adults who had claimed IS as a single parent at any point since April 1999 in Great Britain. For these adults, we also observed the dates on which they were in receipt of any DWP benefit, and information on their claims of tax credits. We do not observe the amount of entitlements to these benefits and tax credits, and nor do we reliably observe earnings, and so we do not look at the impact of the reform on spending on welfare programmes or lone parents' income or poverty.

The outcome measures that relate to receipt of benefits come directly from this dataset (having cleaned the data to remove inconsistencies, as described in Appendix D). But our measure of work needs more discussion. We classified single parents as being "in work" if they had claimed tax credits and had reported that they were working 16 or more hours a week.[12] This will clearly underestimate the true employment rate amongst these single parents. First, the measure of employment clearly omits instances where single parents did paid work for fewer than 16 hours a week. But this is not common, partly because welfare benefits are withdrawn pound-for-pound for single parents who work fewer than 16 h, but also because the in-work tax credit system provides a substantial financial incentive to work 16 or more hours a week (see, for example, Blundell and Shephard, 2011). Second, our measure will also not capture work of 16 h a week or more by single parents who did not claim tax credits when in work. Such non-claiming could be caused either by non-take-up amongst those who were eligible, or by having too high a family income to be eligible. In practice, we think both of these are likely to lead only to small biases: the take-up rate of tax credits amongst all single parents was estimated to be 95% during 2010–11,[13] and a family with children would be entitled to tax credits with a combined gross income of up to £58,000 in the period covered by our data (the 90th centile of earnings across all employees was £46,293 in 2010–11).

Table 1 reports the number of single parents in our sample affected by the reform for each phase and sub-phase alongside with the date of birth of the youngest child and their age at which the parent loses entitlement to IS. Table 2–Table 4 report summary statistics. The treatment and the comparison groups are similar, but the former tend to be older (as expected, given they have older children), exhibit a higher incidence of ill-health or disability, and, has spent more time on IS in the six months before the observation period. The pre-reform cohorts appear very similar to their post-reform counterparts: the exception is the proportion of time spent in work in the 6 months prior to the start of the observation period, but this is because our measure of work does not capture time spent working before April 2003 (in our regressions, we deal with this by interacting this variable with a flexible control for year).

4.2. Outcomes for the affected single parents

Fig. 1 shows, by Phase, how the main benefit and work outcomes evolved through the 36 month window for the single parents who were affected by LPO. It characterises single parents as being in one of the following mutually-exclusive states:

- Receiving Income Support (IS) with Carer's Allowance (CA).
- Receiving the unemployment benefit (JSA).
- Not receiving JSA but receiving the health-related benefit (ESA).
- Not receiving JSA or ESA but receiving IS.
- Not receiving JSA, ESA, IS or CA but in work.
- Not receiving JSA, ESA or IS but receiving CA.
- Not receiving JSA, ESA, IS or CA and not in work.[14]

[12] The information on a claimant's hours worked is needed only for determining entitlement to the Working Tax Credit, but typically the Working Tax Credit is claimed jointly with the Child Tax Credit, and so we refer to the two together as "tax credits" (for example, someone who wants to claim only the Child Tax Credit, knowing that they earn too much to be entitled to the Working Tax Credit will still be asked to report their weekly hours of work when making the claim even though that information is used only for determining entitlement to the Working Tax Credit).

[13] http://www.hmrc.gov.uk/statistics/fin-takeup-stats/cwtc-take-up.pdf. Take-up rates are, in general, lower for those entitlement to smaller amounts, but official statistics do not also break these down by family type.

[14] The outcomes shown for Phase 3 in Fig. 1 are similar to results on destinations from a quantitative survey of single parents who lost entitlement to IS in early 2011 (Coleman and Riley. 2012). That report estimated that amongst those who left IS, 41% were receiving JSA, 13% ESA, 33% were in work, and 9% not on benefit or in work , all measured 12 months after losing entitlement.

Table 1
Definitions of sub-phases of the LPO reform, and final sample size.

Phase	DOB of youngest child	IS end date determined by	Memo: age of youngest child when lose IS entitlement	Sample size
Phase 1 stock	25/11/1992 to 01/03/1993	Child's 16th birthday, from 25/11/2008 to 01/03/2009	Age 16 exactly	7354
Phase 1i stock	02/03/1993 to 24/11/1993	On first of child's 16th birthday or date of first WFI between 02/03/2009 and 28/08/2009	Age 15–16	20,302
Phase 1a stock	25/11/1993 to 01/03/1995	On date of first WFI between 02/03/2009 to 28/08/2009	Aged 14–16	37,863
Phase 1a flow	02/03/1995 to 24/11/1995	Child's 14th birthday, from 02/03/2009 to 24/11/2009	Age 14 exactly	21,370
Phase 1b stock	25/11/1995 to 05/07/1997	On date of first WFI between 06/07/2009 to 06/01/2010	Aged 12–14	52,648
Phase 1b flow	6/07/1997 to 24/11/1997	On child's 12th birthday, from 06/07/2009 to 24/11/2009	Age 12 exactly	13,310
Phase 1,all				152,847
Phase 2a stock	25/11/1997 to 31/01/1999	On date of first WFI between 01/02/2010 to 01/05/2010	Age 11–12	40,827
Phase 2a flow	01/02/1999 to 26/10/1999	Child's 11th birthday, from 01/02/2010 to 26/10/2010	Age 11 exactly	24,850
Phase 2b stock	27/10/1999 to 06/06/2000	On date of first WFI between 07/06/2010 to 07/09/2010	Age 10	21,666
Phase 2b flow	07/06/2000 to 26/10/2000	Child's 10th birthday between 07/06/2010 and 26/10/2010	Age 10 exactly	14,172
Phase 2,all				101,515
Phase 3a stock	27/10/2000 to 24/10/2001	On date of first WFI between 25/10/2010 to 25/01/2011	Age 9–10	36,931
Phase 3a flow	25/10/2001 to 25/10/2002	Child's 9th birthday, from 25/10/2010 to 25/10/2011	Age 9 exactly	36,578
Phase 3b stock	26/10/2002 to 02/01/2004	On date of first WFI between 03/01/2011 to 03/04/2011	Age 7–8	53,059
Phase 3b flow	03/01/2004 to 25/10/2004	Child's 7th birthday, from 03/01/2011 to 25/10/2011	Age 7 exactly	39,935
Phase 3,all				28,341

Source: Authors' calculations based on IS History as described in the text.
Note: The LPO reform was rolled out in consecutive (sub)phases (column 1) which gradually reduced the age of the youngest child at which a lone parent would lose entitlement to IS. The second column shows the range of dates in which the DOB of the youngest child fell in each sub-phase, and the third column explains when the lone parent lost entitlement to IS. The fourth column indicates the age of the youngest child at the time when their parent lost entitlement to IS. WFI = "work focused interview", the name of the meeting between a welfare-receiving single parent and their Case Worker. At the time of LPO. WFIs took place every 3 months for those in Phase 2 and 3, and every 6 months for those in Phase 1.

Table 2
Summary statistics by group for Phase 1.

	Treatment, post reform cohorts		Comparison, post reform cohorts		Treatment, pre-reform cohorts		Comparison, pre-reform cohorts		All	
	Mean	*sd*	*mean*	*sd*	*mean*	*sd*	*mean*	*sd*	*mean*	*sd*
Female	0.892	0.311	0.968	0.175	0.867	0.339	0.966	0.181	0.899	0.302
Age	41.999	6.390	29.333	6.903	41.820	7.112	29.409	6.673	38.233	8.936
White	0.755	0.430	0.740	0.439	0.670	0.470	0.701	0.458	0.690	0.463
Number of children	1.577	0.740	1.925	1.108	1.509	0.696	1.962	1.109	1.646	0.864
Disability	0.402	0.490	0.171	0.376	0.365	0.481	0.203	0.402	0.320	0.467
Proportion of last 6 months before observation on:										
IS	0.751	0.418	0.624	0.453	0.720	0.437	0.612	0.462	0.692	0.445
Work	0.122	0.317	0.153	0.343	0.001	0.019	0.000	0.011	0.020	0.136
JSA	0.010	0.086	0.009	0.077	0.010	0.091	0.008	0.077	0.010	0.087
ESA	0.127	0.327	0.091	0.274	0.104	0.300	0.069	0.243	0.097	0.289
Carer's Allowance	0.098	0.295	0.028	0.161	0.060	0.234	0.021	0.141	0.053	0.221
Deprivation (England)	0.754	0.237	0.761	0.234	0.759	0.236	0.765	0.232	0.760	0.235
Deprivation (Wales)	0.302	0.253	0.286	0.249	0.311	0.258	0.292	0.249	0.305	0.255

Notes and sources: treatment and comparison groups as defined in text. Deprivation is the within-country rank of the ward-level deprivation index.

Table 3
Summary statistics by group for Phase 2.

	Treatment, post reform cohorts		Comparison, post reform cohorts		Treatment, pre-reform cohorts		Comparison, pre-reform cohorts		All	
	Mean	*sd*	*mean*	*sd*	*mean*	*sd*	*mean*	*sd*	*mean*	*sd*
Female	0.920	0.271	0.969	0.173	0.903	0.295	0.966	0.181	0.925	0.263
Age	39.069	6.664	29.212	6.837	38.568	6.604	29.440	6.743	35.682	7.934
White	0.748	0.434	0.743	0.437	0.726	0.446	0.709	0.454	0.725	0.447
Number of children	1.833	0.910	1.923	1.109	1.808	0.884	1.964	1.115	1.858	0.968
Disability	0.322	0.467	0.163	0.369	0.333	0.471	0.199	0.400	0.287	0.452
Proportion of last 6 months before observation on:										
IS	0.727	0.431	0.613	0.457	0.729	0.430	0.637	0.453	0.698	0.440
Work	0.146	0.341	0.178	0.365	0.007	0.072	0.005	0.057	0.029	0.159
JSA	0.008	0.079	0.009	0.079	0.009	0.085	0.010	0.084	0.009	0.084
ESA	0.099	0.293	0.086	0.266	0.087	0.277	0.080	0.259	0.086	0.273
Carer's Allowance	0.091	0.284	0.028	0.162	0.064	0.242	0.023	0.148	0.054	0.223
Deprivation (England)	0.747	0.241	0.756	0.237	0.755	0.237	0.765	0.232	0.757	0.236
Deprivation (Wales)	0.309	0.255	0.301	0.254	0.310	0.255	0.290	0.248	0.304	0.253

Notes and sources: treatment and comparison groups as defined in text. Deprivation is the within-country rank of the ward-level deprivation index.

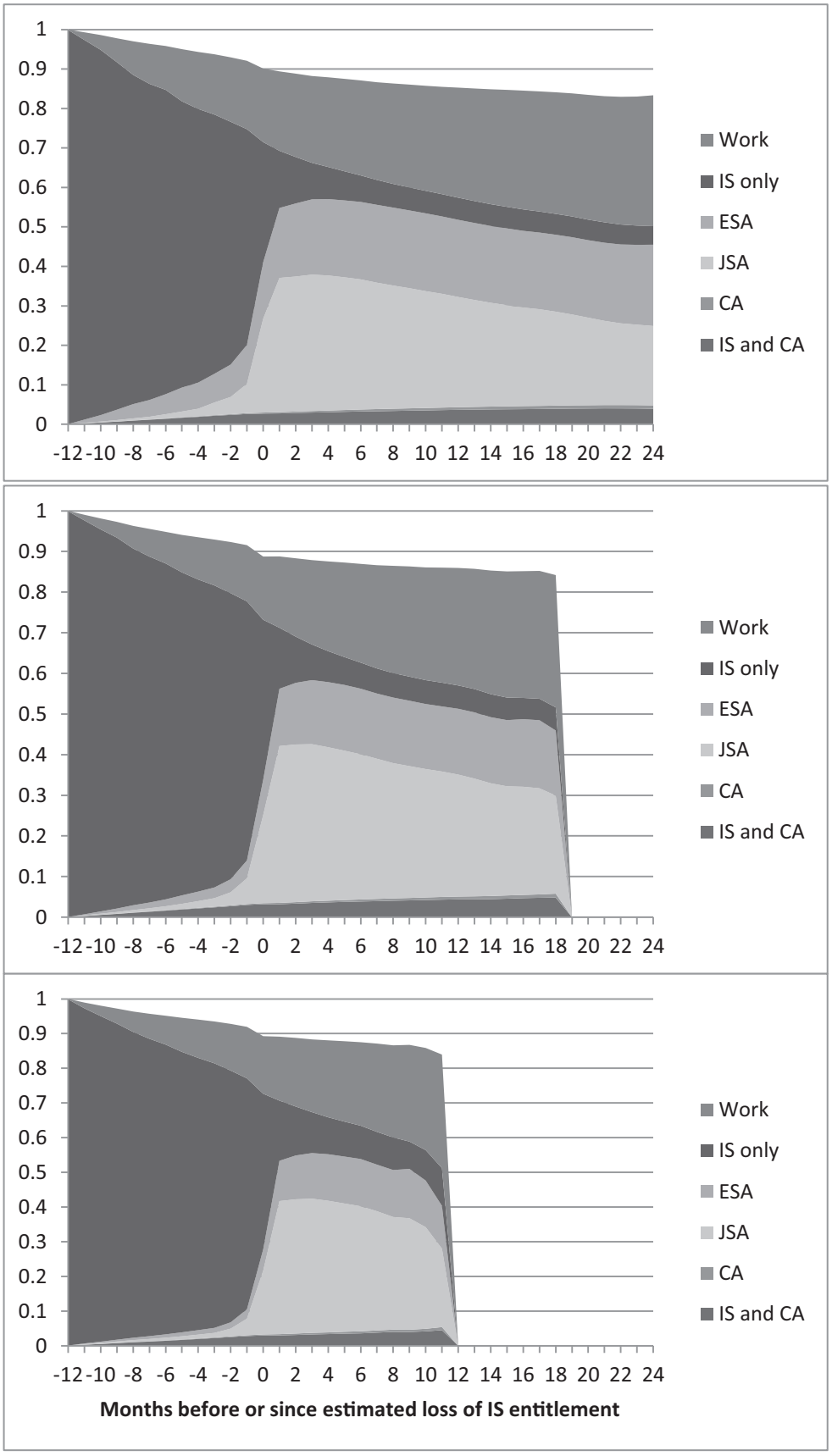

Fig. 1. Fraction of single parents potentially affected by LPO in different labour market or benefit-receiving states, by Phase (top = Phase 1, bottom = Phase 3).
Notes: Sample construction and other covariates are described in the text. IS = Income Support; ESA = Employment and Support Allowance, or other health-related benefits; JSA = Jobseeker's Allowance; CA = Carer's Allowance.

Table 4
Summary statistics by group for Phase 3.

	Treatment, post reform cohorts		Comparison, post reform cohorts		Treatment, pre-reform cohorts		Comparison, pre-reform cohorts		All	
	Mean	*sd*	*mean*	*sd*	*mean*	*sd*	*mean*	*sd*	*mean*	*sd*
Female	0.943	0.232	0.970	0.171	0.931	0.253	0.967	0.178	0.945	0.228
Age	35.472	7.119	29.310	6.867	35.441	6.778	29.432	6.820	33.333	7.411
White	0.727	0.445	0.742	0.437	0.738	0.440	0.718	0.450	0.731	0.443
Number of children	1.956	1.024	1.929	1.102	1.949	1.008	1.955	1.114	1.950	1.047
Disability	0.231	0.421	0.149	0.356	0.280	0.449	0.195	0.396	0.243	0.429
Proportion of last 6 months before observation on:										
IS	0.699	0.443	0.584	0.469	0.738	0.423	0.653	0.446	0.700	0.437
Work	0.169	0.363	0.191	0.383	0.026	0.151	0.028	0.156	0.051	0.211
JSA	0.008	0.074	0.008	0.071	0.009	0.084	0.011	0.087	0.009	0.083
ESA	0.079	0.264	0.085	0.263	0.079	0.264	0.089	0.270	0.082	0.266
Carer's Allowance	0.072	0.254	0.031	0.169	0.057	0.229	0.025	0.153	0.048	0.210
Deprivation (England)	0.745	0.243	0.748	0.241	0.756	0.236	0.766	0.231	0.758	0.235
Deprivation (Wales)	0.300	0.249	0.294	0.251	0.303	0.254	0.288	0.247	0.298	0.251

Notes and sources: treatment and comparison groups as defined in text. Deprivation is the within-country rank of the ward-level deprivation index.

Because of the way the sample was constructed, all the single parents are receiving IS at the start of the window, 12 months before the projected date on which they lost IS entitlement. The fraction receiving IS falls considerably (by over 50 ppts) at the predicted time of losing entitlement (month 0), but some single parents continue to receive IS after that date: 6 months after the predicted loss of entitlement, about 10% of potentially affected single parents are still receiving IS in Phases 1 and 2, and about 13% in Phase 3. We show in Appendix E that, in just under two thirds of these cases, these single parents had experienced a change in circumstances which meant that they were no longer affected by the LPO reform; we are unable to tell whether the remaining cases reflect data inaccuracies or a failure of policy implementation.

Unsurprisingly, the fraction of single parents receiving JSA or ESA rises sharply around the projected date on which the single parents lost IS entitlement; the fraction receiving JSA then declines steadily, and the fraction on ESA grows very slightly. The fraction recorded as being in work increases steadily from the beginning of the observation window beginning (i.e. 12 months before the projected loss of IS entitlement) and there is no discernible jump at the time that single parents are predicted to lose IS entitlement.

The difference between 1 and the shaded areas represents the fraction of the sample not receiving an out-of-work benefit and not recorded as being in work; this group corresponds to the "disconnected" single mothers identified by Blank (2007) that are not in work nor on benefits, and are likely to include many of those who were made financially worse off by the reform. The fraction of single parents in this group increases slowly from the beginning of the observation window, but then jumps up by some 2–3 pp at the time of the predicted loss of entitlement to IS; about 15% of single parents were not observed in work nor on any of the out-of-work benefits at the end of the observation window. It is not possible to tell, amongst those appearing to receive no state support, how many no longer have a dependent child (something that substantially reduces entitlements to benefits) or how many have re-partnered but without claiming tax credits. Our data does not allow us to tell whether any of these (former) single parents went on to be the partner of a claimant of an out-of-work benefit (because only the main claimant is recorded), but Appendix E shows that between 70% and 90% of this group are either not receiving any state support in their own right, or are receiving only child tax credits. Conservatively, and in line with evidence from an earlier survey, we assess that at least 8% of affected single parents lost a significant proportion of their income from state welfare benefits when their entitlement to IS ended, as after that they received either child tax credit only, or no state support at all.[15]

In general, the pattern for the three phases is similar except there is a larger flow towards health-related benefits in Phase 1, and single parents in Phase 3 are slightly more likely to remain on IS than those in the earlier Phases. The differential pattern for Phase 1 is consistent with the incentives engendered by a unrelated benefit reform affecting health-related benefits: from autumn 2008, individuals wanting to claim an out-of-work benefit on the grounds of ill-health or disability had to claim a benefit known as Employment and Support Allowance (ESA) which had a more exacting medical assessment than its predecessor, Incapacity Benefit (IB), and this seems to have led to a larger-than-usual flow of single parents from IS to IB during late 2007 and early 2008. However, the pattern is also consistent with single parents in this Phase being older, on average, and having spent more time on benefit in the past, than those in Phases 2 and 3 (as can be seen by comparing Tables 2– 4). The higher fraction that remain on IS in Phase 3 could reflect that single parents affected by Phase 3 were more likely to have subsequent children than single parents in earlier Phases, who were older and had older children.

These descriptive results provide a first indication that, after the introduction of work search requirements, a fraction of single parents did move into work, but a significant proportion also moved onto health-related benefits or non-claimant unemployment.

5. The estimated impact of LPO on benefit and work outcomes

5.1. A graphical assessment of the difference-in-differences design

Figs. 2–4 provide a graphical assessment of the difference-in-differences design. Each graph plots the difference in the mean outcomes of the treatment and comparison groups, separately for each of the 6 cohorts, and with outcomes measured 15 months from the start of the observation period,[16] and having stripped out the impact of individual-level covariates (equivalently, each point represents the difference between $\hat{\delta}_g$ and $\hat{\delta}_h$ from Eq. (2), where g and h are the two groups with different treatment statuses from a given cohort). Each Figure consists of one graph for each sub-phase, along with a summary graph for each Phase, and different Figures are for different outcomes; a vertical line separates the final, post-reform, cohort.

The way we implement the DiD design requires us to assume that the treatment-comparison group differences are identical in all 5 pre-reform cohorts, and that this difference would represent the unobserved,

[15] In broad terms, these findings are consistent with those from a bespoke survey of single parents affected by Phase 3 of LPO. Of these single parents, whose entitlement to IS ended in early 2011, 11% were not in work and not receiving any of IS, ESA or JSA when interviewed 12 months later, half of whom had re-partnered (Coleman and Riley (2012)).

[16] For brevity, we report only the results for outcomes measured after 15 months, but the conclusions hold for the other outcomes as well.

Fig. 2. Differences in the probability of being on Income Support 15 months after treatment between the treated and the control group.

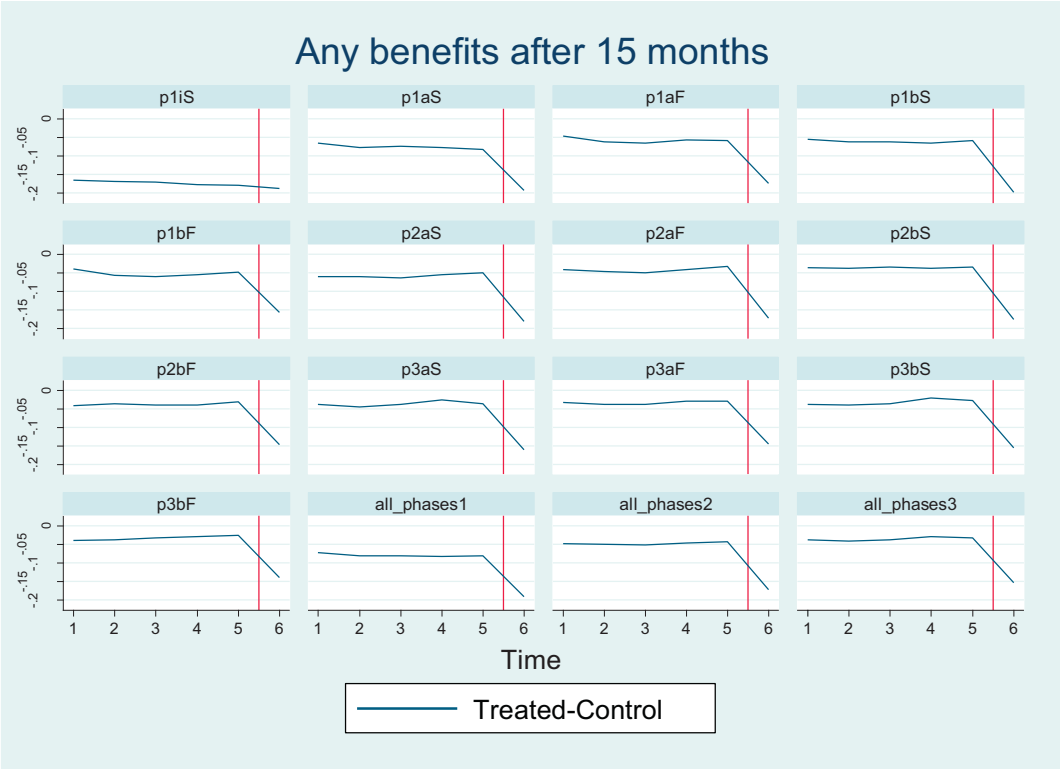

Fig. 3. Differences in the probability of being on any out-of-work benefits 15 months after treatment between the treated and the control group.

Fig. 4. Differences in the probability of being in work 15 months after treatment between the treated and the control group.

post-reform difference in untreated outcomes. The second part of this statement is untestable, but, in general, Figs. 2–4 show stable pre-reform differences in outcomes, lending support to the assumption of common trends between the two groups. For example, in Fig. 2, the difference in the probability of being on IS between the treated and the control group is stable and generally close to zero, but drops to 60pp after the reform. It is for this reason that our preferred results use the basic DiD specification in Eq. (2). Estimates of the impact of LPO based on a variant of (2) that allow for group-specific linear time trends produced point estimates of the impact of LPO are always very similar to our standard specification; results are available on request.

5.2. *The difference-in-difference estimates of the impact of LPO*

In this section we report our estimated impacts of LPO, as given by the coefficient β_2 from Eq. (2), for the different outcomes.

Table 5 reports the DiD estimates of the impact of the introduction of work search requirements on the probability that a single parent is on the unconditional benefit, income support (IS), at different points in time. The estimates suggest that the reform began to induce some single parents to leave IS at least three months before the predicted date of their loss of IS entitlement (column 2); this response is larger for the earlier Phases. But the main impact occurs around the time of the predicted loss of entitlement: three months after this date, the reform has reduced the probability of being on IS by 46pp in Phase 1, and by over 55pp in Phases 2 and 3. These impacts are below 100 pp partly because some single parents remain on IS (as shown in Appendix E) and partly because some would have left IS in the absence of the LPO reform.

Table 6 reports the DiD estimates of the impact of the introduction of work search requirements on the probability that a single parent received any of the main three out-of-work benefits (IS, JSA, ESA). Three months after the predicted loss of entitlement to IS, LPO had reduced the fraction of single parents receiving an out-of-work benefit by 11 to 13 ppts (across Phases). This impact then rises over time, but relatively slowly, so that none of the estimated impacts of LPO on the fraction of single parents receiving an out-of-work benefit exceed 20pp by the end of the observation window.

The number of single parents moved off all out-of-work benefits is therefore considerably smaller than the number of single parents moved off IS by the reform, and this is because the reform led single parents in many cases to switch benefits. Tables 7 and 8 report the DiD estimates of the impact of LPO on the fraction receiving the unemployment benefit with search conditionalities (JSA), and on the fraction receiving the health-related benefit (ESA). LPO had little impact on the fraction of single parents receiving unemployment benefits before the predicted loss of entitlement to IS (see the first two columns of Table 7), but LPO did cause substantial flows onto JSA after that: 3 months after the predicted loss of IS entitlement, LPO had increased the fraction receiving JSA by between 24 ppts and 36 ppts across all sub-phases except the first. This impact then falls over the observation period, especially for the single parents in Phase 1.

Table 8 shows that, 3 months after the predicted loss of entitlement to IS, LPO had increased the fraction of single parents receiving ESA by between 10 and 14 pp; this impact is fairly stable after this. There is evidence of considerable movement onto ESA in advance of the predicted loss of entitlement to IS amongst single parents in Phase 1: we attribute this to an unrelated but pre-announced reform to health-related benefits that made it less attractive to start a claim of health-related benefits after autumn 2008.

Table 9 reports the DiD estimates of the impact of LPO on the probability of being in work. Three months after the loss of entitlement to IS, the introduction of work search requirements is estimated to have increased the share in work by around 7 percentage points. This estimated impact then rises slowly with time since time since the predicted loss of entitlement to IS, falling (for example) just short of 12pp 15 months after the loss of entitlement to IS in Phase 2.

5.2.1. *Overview and discussion*

The results in Tables 5–9 show a broadly consistent pattern across phases. Overall, LPO increases the probability of leaving the uncondi-

Table 5
DiD estimates of impact of LPO on the probability of receiving IS at different intervals relative to predicted loss of IS entitlement.

Months since predicted loss of IS entitlement	(1) −9	(2) −6	(3) +3	(4) +9	(5) +12	(6) +15	(7) +24
p1iS	−0.3	−8.0***	−18.1***	−19.6***	−20.1***	−19.2***	−21.1***
	(0.4)	(0.7)	(1.5)	(1.1)	(1.0)	(1.2)	(1.6)
p1aS	−.8*	−10.4***	−48.0***	−47.1***	−36.6***	−22.9***	−21.3***
	(0.3)	(0.7)	(0.7)	(0.8)	(2.7)	(2.0)	(1.6)
p1aF	−2.3***	−8.4***	−51.4***	−48.8***	−47.5***	−45.6***	−31.5***
	(0.4)	(0.6)	(0.7)	(0.7)	(0.8)	(0.8)	(2.2)
p1bS	−1.7**	−11.9***	−51.0***	−50.3***	−49.1***	−47.6***	−43.1***
	(0.4)	(0.4)	(0.4)	(0.4)	(0.3)	(0.5)	(0.8)
p1bF	−1.5**	−4.5***	−51.4***	−51.7***	−50.5***	−49.0***	−45.9***
	(0.3)	(0.5)	(0.9)	(1.2)	(1.1)	(0.8)	(0.5)
p2aS	−.8*	−8.3***	−56.8***	−55.2***	−53.4***	−51.8***	
	(0.3)	(0.6)	(0.6)	(0.6)	(0.8)	(0.6)	
p2aF	−2.4***	−−8.3***	−59.9***	−55.9***	−54.2***	−53.3***	
	(0.3)	(0.7)	(0.8)	(0.9)	(1.0)	(0.9)	
p2bS	−1.3***	−7.9***	−58.4***	−56.6***	−54.6***	−44.7***	
	(0.2)	(0.6)	(0.3)	(0.7)	(0.8)	(0.9)	
p2bF	−.9*	−3.7***	−57.9***	−55.9***	−54.8***	−54.4***	
	(0.3)	(0.5)	(0.5)	(0.8)	(0.7)	(1.0)	
p3aS	−.8**	−4.1***	−57.7***	−54.4***			
	(0.2)	(0.8)	(0.8)	(1.5)			
p3aF	−2.1***	−5.9***	−59.6***	−55.5***			
	(0.4)	(0.5)	(0.6)	(0.4)			
p3bS	−1.1*	−6.3***	−55.7***				
	(0.5)	(0.9)	(0.9)				
p3bF	−.7	−3.3***	−57.6***				
	(0.3)	(0.5)	(0.7)				
p3cF	−1.0***	−3.3***					
	(0.2)	(0.6)					
all_phases1	−1.4***	−9.9***	−46.2***	−45.5***	−42.1***	−37.6***	−28.7***
	(0.2)	(0.4)	(0.5)	(0.5)	(1.1)	(1.0)	(1.3)
all_phases2	−1.3***	−7.4***	−58.0***	−55.6***	−53.9***	−51.3***	
	(0.2)	(0.5)	(0.4)	(0.5)	(0.6)	(0.6)	
all_phases3	−1.1**	−4.7***	−57.1***	−54.6***			
	(0.3)	(0.5)	(0.6)	(0.8)			

Notes: Sample construction and other covariates are described in the text.
* $p<.10$ ** $p<.05$ *** $p<.01$
Standard errors are estimated following Donald and Lang (2007), treating a "group" as the interaction of "treatment/comparison" and "cohort".

tional income support by over 50pp, but even at the end of our observation period the probability of being in work only increases by about 10pp. Most of this latter effect is already evident shortly after the loss of entitlement to IS. For example, in Phase 2 (Phase 3) over 60% (70%) of the impact on work outcomes measured at the end of the observation period has already occurred after 3 months. The impact of the reform on the fraction of single parents claiming the unemployment benefit, JSA, is large from the beginning, but not sufficient to account for the entire difference between the fraction pushed off IS and that moved into work. Instead, the reform has induced non-negligible flows towards health-related benefits (which carry no search conditionalities), increasing the probability that a single parent claims the health-related benefits by around 10pp three months after the regime change, a larger impact than the impact on being in work, and towards non-claimant unemployment.

The impacts in Phases 2 and 3 were similar to each other,[17] but those in Phase 1 were different, with the estimated impact of LPO on leaving out-of-work benefits or moving into work being smaller for single parents in Phase 1. This reflects several differences between the phases. First, the LPO reform represented a smaller policy change for single parents in Phase 1, since their children were already close to the age at which they would have lost entitlement to IS in the absence of the reform (for example, single parents in "Phase 1a Stock" lost their entitlement to IS at most 2 years and potentially as little as 1 day earlier than they would have done had LPO not been introduced, but single parents in "sub-phase 3b Flow" lost IS entitlement 7 years earlier than they would have done had LPO not been introduced). Second, as discussed earlier, the single parents in Phase 1 were also affected by a reform to health-related benefits that gave an incentive for individuals to claim a health-related benefit before autumn 2008 to avoid a tougher medical assessment. Third, single parents in Phase 1 have older children (by construction), and so tend to be older themselves, and so are less likely to have additional children. Finally, single parents in Phase 1 have tended to have spent longer out of work, and so are more disadvantaged than single parents in the later Phases.

To provide an overview of the results so far, Fig. 5 plots the estimated impacts of the LPO reform on the probability of work (dashed line), the probability of claiming health-related benefits with no attached search conditionalities, and the probability of being in non-claimant unemployment (computed as the impact on the probability that a single parent is on any benefit minus the impact on the probability of being in work). In Phases 2 and 3, the impact of LPO on the probability of being in non-claimant unemployment is at least 6pp by the end of the observation period, and always amounts to a considerable fraction of the impact on the probability of being work (plotted in Fig. 5 as a dashed black line). For example, 9 months after the loss of entitlement to IS (which is the last observation point available for all three phases), the implied impact on the probability of being in non-claimant unemployment is more than 60% of that on the probability of employment.

The flow towards non-claimant unemployment could also be due to (i) people working less than 16 hours per week (who would not be recorded as in-work in our data) and (ii) people who were previously making a fraudulent claim of IS who then decide not to claim another benefit when they lose entitlement to IS. As discussed in Section 4.1, we do not think that employment for less than 16 hours is likely to be

[17] Nevertheless, they are generally statistically different from each other.

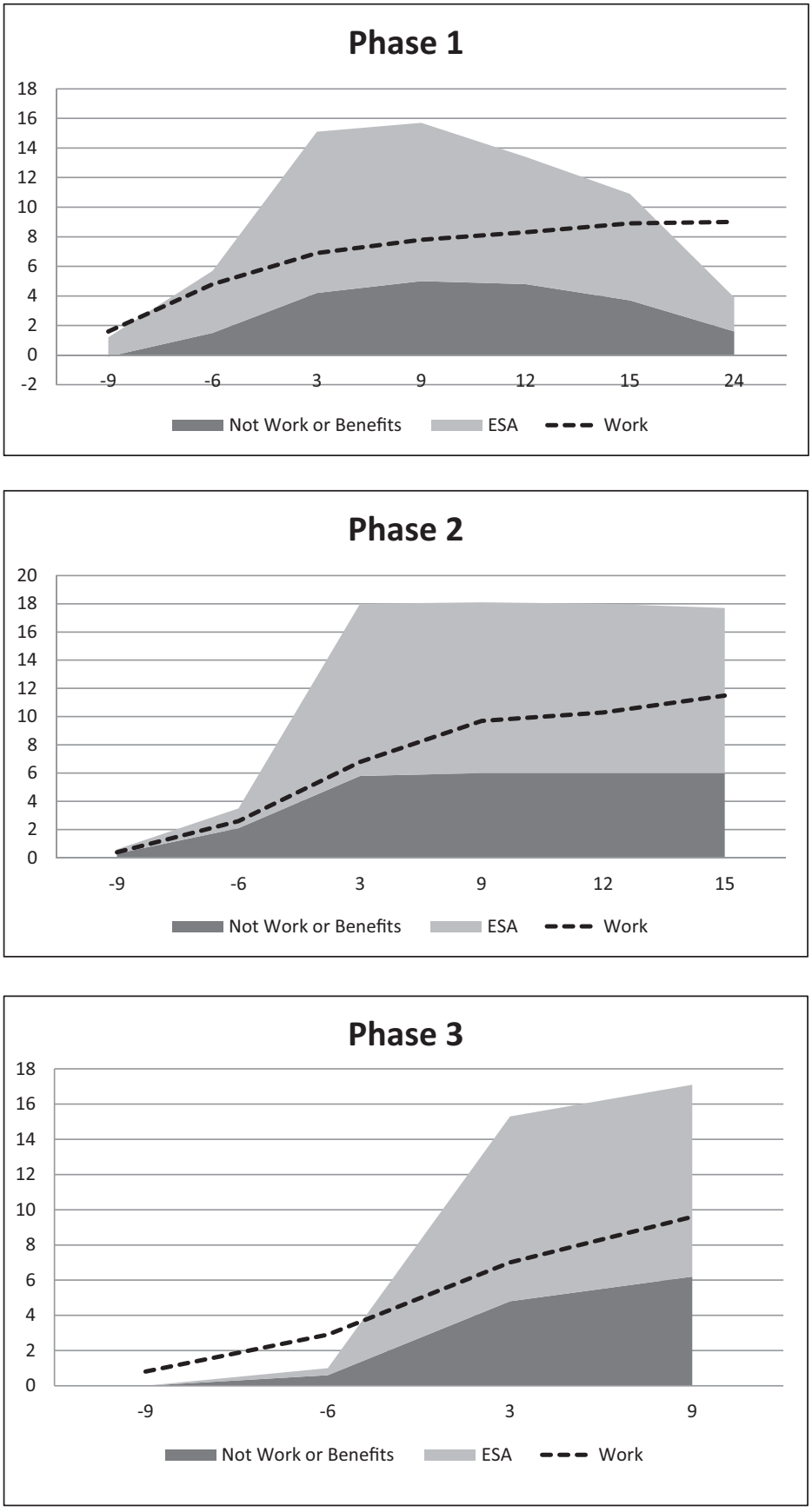

Fig. 5. The impact of LPO on the probability that a lone parent is in work, on health-related benefits or not in work nor on benefits.
Note: DiD estimates of the impact of LPO on different outcomes. "Not in Work or on Benefits" is the differences between the effect on the probability of being on IS and the sum of the effects on the probability of being in work, on JSA and ESA.

Table 6
DiD estimates of impact of LPO on the probability of receiving any out-of-work benefit at different intervals relative to predicted loss of IS entitlement.

Months since predicted loss of IS entitlement	(1) −9	(2) −6	(3) +3	(4) +9	(5) +12	(6) +15	(7) +24
p1iS	−0.6	−4.9***	−1.6*	−2.0*	−3.1**	−3.5***	−5.6**
	(0.4)	(0.8)	(0.6)	(0.8)	(0.8)	(0.7)	(1.3)
p1aS	−1.0**	−7.3***	−11.8***	−13.4***	−11.6***	−7.9***	−7.8***
	(0.3)	(0.7)	(0.7)	(0.7)	(2.3)	(1.3)	(1.2)
p1aF	−2.0**	−5.1***	−11.6***	−13.4***	−14.7***	−14.4***	−11.7***
	(0.5)	(0.7)	(0.7)	(0.7)	(0.8)	(0.8)	(2.0)
p1bS	−1.9***	−7.2***	−13.7***	−15.7***	−16.5***	−17.2***	−17.0***
	(0.3)	(0.4)	(0.4)	(0.4)	(0.3)	(0.5)	(0.8)
p1bF	−1.3***	−2.7***	−10.5***	−13.5***	−15.2***	−15.6***	−16.8***
	(0.2)	(0.5)	(0.9)	(1.1)	(1.1)	(0.9)	(0.5)
p2aS	−0.4	−5.4***	−12.3***	−16.5***	−16.8***	−17.2***	
	(0.4)	(0.5)	(0.6)	(0.5)	(0.7)	(0.5)	
p2aF	−1.5***	−4.6***	−13.0***	−15.9***	−16.5***	−17.7***	
	(0.3)	(0.6)	(0.7)	(0.7)	(0.8)	(0.8)	
p2bS	−.8**	−5.3***	−14.0***	−15.9***	−16.4***	−18.3***	
	(0.2)	(0.5)	(0.2)	(0.7)	(0.7)	(0.7)	
p2bF	−0.6	−2.8***	−11.0***	−13.5***	−14.7***	−16.2***	
	(0.3)	(0.5)	(0.4)	(0.7)	(0.8)	(0.8)	
p3aS	−.6**	−3.3**	−12.5***	−15.9***			
	(0.2)	(0.7)	(0.7)	(1.4)			
p3aF	−1.5**	−3.7***	−11.2***	−14.7***			
	(0.3)	(0.4)	(0.5)	(0.6)			
p3bS	−0.7	−4.8***	−12.3***				
	(0.5)	(0.8)	(0.9)				
p3bF	−0.5	−2.6***	−10.6***				
	(0.3)	(0.4)	(0.7)				
p3cF	−.7**	−2.5**					
	(0.2)	(0.6)					
all_phases1	−1.5***	−6.3***	−11.1***	−12.8***	−13.1***	−12.6***	−10.6***
	(0.2)	(0.5)	(0.5)	(0.4)	(0.8)	(0.6)	(1.1)
all_phases2	−.7**	−4.7***	−12.6***	−15.7***	−16.3***	−17.5***	
	(0.2)	(0.4)	(0.4)	(0.4)	(0.5)	(0.5)	
all_phases3	−.8**	−3.5***	−11.8***	−15.8***			
	(0.2)	(0.4)	(0.5)	(0.9)			

Notes: Sample construction and other covariates are described in the text.
* $p<.10$ ** $p<.05$ *** $p<.01$
Standard errors are estimated following Donald and Lang (2007), treating a "group" as the interaction of "treatment/comparison" and "cohort".

substantial due to the disincentives built into the tax and benefit system.[18] In Appendix C, we show that the estimated incidence of fraudulent claims is small. Moreover, as we discuss in the next section, we find that the flow towards non-claimant unemployment is slightly larger for lone parents who have spent more time on IS. We do not see obvious reasons why the incidence of part-time employment or fraudulent claims should be higher in this group. Furthermore, the results show a sustained increase in the flow towards health-related benefits as well for this group, which is again suggestive of mechanisms such as those discussed in Petrongolo (2009) rather than a higher propensity to take up part-time employment or a disproportional rate of fraudulent claims.

The lighter area in Fig. 5 shows the effect of LPO on the probability that a lone parent claims health-related benefits. It shows that the introduction of work search requirements caused more single parents to either claim health-related benefits with no search conditionalities or enter non-claimant unemployment than to enter employment (as the sum of the two grey areas is greater than the dashed line, except for the last observation period for phase 1).

Overall, however, we stress that these results are consistent with the predictions of a simple search model in which individuals with low level of initial search might give up searching and move to other benefits without search requirements (such as the health-related benefits) or enter non-claimant unemployment status (Manning, 2009, Petrongolo, 2009).[19] To further investigate the credibility of this interpretation we look in the next sub-section at the impact of the introduction of the work search requirements on single parents with different degrees of initial labour market attachment, as proxied by the proportion of time spent on income support before the beginning of the observation period.

We note that LPO began to be implemented during the recession that began in 2008. The unemployment rate grew for most of the period covered by our data, and aggregate output did not return to pre-recession levels until well after the end of our observation period. The difference-in-differences design means that our estimates of the reform's impact have been purged of any impact of the macroeconomic conditions common to lone parents with younger and older children, but it is possible that the impact of an LPO-like reform itself varies with the economic environment. The standard story is that activation policies that increase effective labour supply have less impact in downturns because of labour demand constraints. If so, then the impact of LPO on employment outcomes in normal times could be greater than that presented

[18] This is confirmed from earlier qualitative work following lone parents leaving IS among whom only a small minority (<5%) expressed a preference for working less than 16 h, with a spike wishing to work exactly 16 h. See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/214373/rrep818.pdf.

[19] Manning (2009) finds no evidence of increased search intensity following the introduction of work search requirements for the unemployed in the UK in 1996, and Petrongolo (2009) finds a negative effect of the probability of employment and positive one on the probability of moving onto health-related benefits. Petrongolo looks at all unemployed (not just single parents) and her identification strategy compares claimants whose spell begins shortly before the introduction of JSA with claimants whose spell begins shortly after the introduction of JSA.

Table 7
DiD estimates of impact of LPO on the probability of receiving JSA at different intervals relative to predicted loss of IS entitlement.

Months since predicted loss of IS entitlement	(1) −9	(2) −6	(3) +3	(4) +9	(5) +12	(6) +15	(7) +24
p1iS	−0.1	1.7***	5.0**	6.4***	6.2***	5.2**	5.1***
	(0.1)	(0.2)	(1.5)	(1.2)	(1.2)	(1.5)	(0.9)
p1aS	0.0	1.8***	24.1***	21.6***	13.4***	4.0**	2.7**
	(0.0)	(0.1)	(0.2)	(0.2)	(0.6)	(1.0)	(0.8)
p1aF	.2**	1.7***	28.1***	23.8***	21.5***	19.9***	8.0***
	(0.0)	(0.1)	(0.0)	(0.1)	(0.1)	(0.1)	(0.6)
p1bS	0.0	2.6***	27.5***	23.9***	21.9***	19.6***	14.9***
	(0.0)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.2)
p1bF	0.0	0.2	31.3***	27.2***	24.5***	22.7***	16.7***
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
p2aS	0.0	1.1***	31.6***	25.7***	23.8***	21.9***	
	(0.0)	(0.0)	(0.1)	(0.1)	(0.1)	(0.1)	
p2aF	.2***	2.0***	34.0***	27.6***	25.3***	23.2***	
	(0.0)	(0.0)	(0.1)	(0.1)	(0.1)	(0.1)	
p2bS	0.1	1.2***	32.4***	28.3***	26.0***	17.2***	
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	
p2bF	0.0	0.0	34.4***	29.3***	27.2***	24.7***	
	(0.0)	(0.1)	(0.1)	(0.2)	(0.2)	(0.2)	
p3aS	0.0	0.0	34.1***	27.4***			
	(0.0)	(0.1)	(0.2)	(0.2)			
p3aF	.2***	1.3***	35.6***	28.6***			
	(0.0)	(0.1)	(0.0)	(0.1)			
p3bS	.1**	0.7***	33.0***				
	(0.0)	(0.0)	(0.1)				
p3bF	0.0	.2*	36.2***				
	(0.0)	(0.1)	(0.1)				
p3cF	.2**	0.0					
	(0.0)	(0.0)					
all_phases1	0.0	1.9***	24.2***	21.4***	18.0***	14.2***	7.3***
	(0.0)	(0.1)	(0.3)	(0.3)	(0.4)	(0.6)	(0.4)
all_phases2	.1***	1.2***	32.8***	27.2***	25.0***	21.7***	
	(0.0)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	
all_phases3	0.1***	.5***	34.3***	27.5***			
	(0.0)	(0.1)	(0.1)	(0.2)			

Notes: Sample construction and other covariates are described in the text.
* $p < .10$ ** $p < .05$ *** $p < .01$
Standard errors are estimated following Donald and Lang (2007), treating a "group" as the interaction of "treatment/comparison" and "cohort".

here. On the other hand, it is also plausible that the slowdown discouraged job searching among lone parents with younger children by more than among the treated lone parents, and this would mean that the impact of LPO on employment outcomes in normal times could be lower than that presented here.

5.3. Heterogeneous effects by level of previous labour market attachment

Table 10 presents estimates of the impact of work search requirements on subsamples of single parents, defined by the proportion of time they had spent receiving the unconditional income support benefit in the 36 months before the observation period. We interpret this variable as measuring a lack of labour market attachment. We define three groups: those spending between 90% and 100% of the previous 36 months receiving IS (63% of all single parents in the sample); those spending between 50% and 90% of the previous 36 months receiving IS (17% of the sample); those spending less than 50% of the previous 36 months receiving IS (20% of the sample). Our interpretation of this variable as a lack of labour market attachment is confirmed by data from the pre-reform cohorts. This shows that (for example) 15 months into the observation window, 14% of the group with the highest proportion of time spent on IS are now in work across all phases; for the other two groups the fraction in work after 15 months is above 22%.

The first three columns of Table 10 show that the introduction of work search requirements reduced the probability of being on any benefits by the largest magnitude for the group with the lowest level of labour market attachment. The differences in the coefficients between the two extreme groups are generally statistically significant.[20] The following three columns indicate that the impact on work was also greatest for the group with the lowest labour market attachment – but the differences with the group with the highest labour market attachment are generally not statistically significant.[21] However, the impact on receiving a health-related benefits (with no search conditionalities) is also the largest for the group with the lowest labour market attachment (and the differences with the first group are generally statistically significant).[22] The final three columns consider the implied effect on the probability that a single parent is in non-claimant unemployment (again, computed as the difference between the impact on the probability of claiming any benefits and that of being in work). The differences across the three groups with different labour market attachments are not large, but there are larger flows towards non-claimant unemployment for the group with the weakest labour market attachment later in the observation window (as shown in the lower rows in the table). Overall, the reform appears to have generated stronger flows of single parents with low initial level of labour market attachment both towards work and towards states with no search conditionalities, namely health-related benefits and non-claimant unemployment.

[20] For the probability of being on any benefits all but two differences in the coefficients between the two extreme groups are statistical significant (phase 2 and 3 at interval +3).

[21] For the probability of being in work, only the differences between the coefficients for the two extreme grops for phase 1 at interval +3 and at interval +12 are statistically significant.

[22] For the probability of being on health-related benefits all differences are statistically significant except for that at interval +24 for phase 1.

Table 8
DiD estimates of impact of LPO on the probability of receiving a health-related benefit (ESA/IB/SDA) at different intervals relative to predicted loss of IS entitlement.

Months since predicted loss of IS entitlement	(1) −9	(2) −6	(3) +3	(4) +9	(5) +12	(6) +15	(7) +24
p1iS	1.0**	4.3***	0.2	−1.9**	−3.1***	−3.4**	−5.1***
	(0.4)	(0.4)	(0.5)	(0.4)	(0.6)	(0.8)	(1.0)
p1aS	0.5	5.0***	13.6***	12.6***	5.8***	1.2***	−1.1
	(0.3)	(0.3)	(0.3)	(0.2)	(0.3)	(0.2)	(0.5)
p1aF	1.4***	4.2***	14.3***	13.8***	13.0***	12.7***	5.5***
	(0.1)	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)	(0.6)
p1bS	1.9***	4.2***	11.7***	12.4***	12.1***	11.9***	12.3***
	(0.1)	(0.2)	(0.2)	(0.0)	(0.1)	(0.2)	(0.4)
p1bF	1.1***	2.0***	10.8***	11.9***	11.5***	11.3***	12.4***
	(0.2)	(0.3)	(0.3)	(0.5)	(0.4)	(0.4)	(0.5)
p2aS	0.5**	2.1***	12.9***	12.8***	12.5***	12.1***	
	(0.1)	(0.2)	(0.3)	(0.3)	(0.2)	(0.2)	
p2aF	0.4	1.3***	12.3***	11.7***	11.6***	11.4***	
	(0.2)	(0.3)	(0.3)	(0.2)	(0.3)	(0.2)	
p2bS	−0.1	0.8***	11.4***	11.7***	11.5***	10.1***	
	(0.2)	(0.2)	(0.3)	(0.4)	(0.4)	(0.3)	
p2bF	0.0	0.4	11.8***	12.1***	12.0***	12.4***	
	(0.2)	(0.4)	(0.4)	(0.4)	(0.3)	(0.9)	
p3aS	0.0	0.4**	10.6***	10.8***			
	(0.1)	(0.2)	(0.2)	(0.4)			
p3aF	0.1*	0.6***	12.1***	11.6***			
	(0.0)	(0.1)	(0.2)	(0.3)			
p3bS	0.0	0.3	9.8***				
	(0.1)	(0.2)	(0.3)				
p3bF	0.0	0.1	10.2***				
	(0.1)	(0.1)	(0.2)				
p3cF	−0.1	0.4					
	(0.1)	(0.3)					
all_phases1	1.3***	4.2***	10.9***	10.7***	8.6***	7.2***	2.3***
	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.3)
all_phases2	0.3	1.4***	12.2***	12.1***	12.0***	11.7***	
	(0.2)	(0.2)	(0.3)	(0.2)	(0.2)	(0.2)	
all_phases3	0.0	0.4***	10.5***	10.9***			
	(0.0)	(0.0)	(0.2)	(0.3)			

Notes: Sample construction and other covariates are described in the text.
* $p < .10$ ** $p < .05$ *** $p < .01$
Standard errors are estimated following Donald and Lang (2007), treating a "group" as the interaction of "treatment/comparison" and "cohort".

To assess the relative size of these effects across the three groups, Fig. 6 plots the difference between the impact of LPO on the probability of claiming health-related benefits or of being in non-claimant unemployment, and the probability of being in work (and so positive numbers indicate that LPO induced larger flows towards one of the states with no conditionalities than into work). It is very clear that the flow towards states with no conditionalities attached is larger for the groups with the lowest level of initial labour market attachment, and this is true across phases and observation periods.

Overall, these findings are consistent with the predictions of the search model in Petrongolo (2009): they indicate that work search requirements have tended to push individuals with low levels of labour market attachment more towards benefits with no search conditionalities attached or into non-claimant unemployment than into work. There is some suprising evidence that lone parents with low labour market attachment might have been more likely to move into work, but this evidence appear statistically weaker.

5.4. Discussion

It is interesting to compare the size of the estimated impacts to other reforms affecting lone parents. Appendix E does this for other interventions in the UK that have affected lone parents receiving welfare benefits. It shows that LPO had a much greater (almost an order of magnitude greater) impact than interventions that were voluntary, or that were requiring lone parents only to meet with advisers (and not requiring them to undertake any job search activity).

The other comparison is to in-work benefits, which have historically been used to increase labour supply amongst lone parents: see Brewer et al. (2006), Francesconi and van der Klaauw (2007), and Gregg et al. (2009) for UK evidence on the Working Families' Tax Credit for lone parents, and Nicols and Rothstein (2016) for a review of US evidence on the Earned Income Tax Credit. Gregg et al. (2009) report that WFTC and contemporaneous reforms increased the probability of employment amongst all lone parents in the UK by 3.8 to 5.2 ppts, depending on the choice of comparison group (taken from text on pF43; the first 2 columns of their Table 2 reports AMEs of 0.037 and 0.053), and Brewer et al. (2006) estimated that the same set of reforms increased employment by 3.7 ppts. Our estimated impact of the LPO reform on employment implies a considerably larger change in employment. Given a pre-reform employment rate of around 70 percent, and assuming that the LPO reform does not affect the rate of job loss of lone parents, and that all lone mothers not in work are on welfare benefits, the estimated increase in the flow into work 12 months after the reform of 10.2 ppts or 8.3 ppts (our Table 9, results for Phase 2 and Phase 1 respectively) corresponds to an 8 ppt increase in the employment rate of lone mothers whose children are aged 10 to 11, and a 7 ppt increase in the employment rate of lone mothers whose children are aged to 15.[23] This simple

[23] On the other hand, neither of the papers examining WFTC examined whether the employment response varied by the age of children in the family; Blundell and Shephard (2012), using data from the same period, conclude that lone parents with children over 5 have a higher participation elasticity than those under 5, so it is possible that the response to WFTC amongst lone parents with children aged 10 or over was greater than the headline 3.7 ppts.

Table 9
DiD estimates of impact of LPO on the probability of being in work at different intervals relative to predicted loss of IS entitlement.

Months since predicted loss of IS entitlement	(1) −9	(2) −6	(3) +3	(4) +9	(5) +12	(6) +15	(7) +24
p1iS	1.1	4.6**	3.5	4.9	5.4	5.7	9.6
	(0.2)	(0.7)	(1.3)	(2.6)	(3.1)	(3.0)	(5.8)
p1aS	1.0**	6.3*	7.4**	8.3***	7.2**	6.1*	7.6
	(0.0)	(1.7)	(1.2)	(1.3)	(2.0)	(2.1)	(4.3)
p1aF	1.5**	3.2**	6.1***	7.4***	8.2***	8.5***	7.3**
	(0.0)	(0.5)	(0.2)	(0.2)	(0.5)	(0.6)	(2.1)
p1bS	2.3	5.4*	7.9***	9.0***	10.0***	10.9***	11.0***
	(0.5)	(1.3)	(0.5)	(0.3)	(0.4)	(0.7)	(0.9)
p1bF	1.1	1.9**	5.3**	7.0***	8.2***	8.6***	10.0***
	(0.4)	(0.4)	(0.6)	(0.9)	(1.2)	(1.0)	(0.8)
p2aS	.4**	2.6**	6.1***	10.0***	10.1***	11.0***	
	(0.1)	(0.4)	(0.3)	(0.7)	(0.8)	(0.9)	
p2aF	.9*	2.8**	7.6***	10.3***	10.9***	12.0***	
	(0.2)	(0.5)	(0.4)	(0.6)	(0.5)	(0.3)	
p2bS	0.6	3.8	8.4***	10.5***	10.9***	11.6***	
	(0.5)	(1.7)	(0.1)	(0.3)	(0.4)	(0.6)	
p2bF	0.5	2.0**	6.7***	9.4***	10.0***	12.2***	
	(0.3)	(0.4)	(0.2)	(0.7)	(0.6)	(0.8)	
p3aS	0.5	2.5***	6.9***	9.9***			
	(0.6)	(0.3)	(0.8)	(1.0)			
p3aF	1.2**	3.1***	7.0***	8.7***			
	(0.2)	(0.4)	(0.3)	(0.8)			
p3bS	0.6	3.5***	6.8***				
	(0.4)	(0.5)	(0.5)				
p3bF	0.5	2.3***	6.4***				
	(0.3)	(0.5)	(0.4)				
p3cF	0.5	2.0**					
	(0.3)	(0.6)					
all_phases1	1.6***	4.8**	6.9***	7.8***	8.3***	8.9***	9.0**
	(0.1)	(0.5)	(0.6)	(0.4)	(0.8)	(1.5)	(3.1)
all_phases2	0.4	2.6***	6.8***	9.7***	10.3***	11.5***	
	(0.2)	(0.3)	(0.2)	(0.6)	(0.4)	(0.4)	
all_phases3	0.8	2.9***	7.0***	9.6***			
	(0.2)	(0.4)	(0.4)	(0.7)			

Notes: Sample construction and other covariates are described in the text.
* $p < .10$ ** $p < .05$ *** $p < .01$
Standard errors are estimated following Donald and Lang (2007), treating a "group" as the interaction of "treatment/comparison" and "cohort".

Table 10
The effect of LPO on the probability of being in different states by proportion of time spent on Income Support in the 36 months prior to the observation period.

	Any out-of-work benefits			Work			ESA			Non-claimant Unemployment (a)		
	0–50	50–90	90–100	0–50	50–90	90–100	0–50	50–90	90–100	0–50	50–90	90–100
Interval: +3												
all_phases1	−.088***	−.086***	−.116***	.038*	.051***	.075***	.066***	.089***	.124***	0.05	0.035	0.041
	(0.004)	(0.009)	(0.006)	(0.013)	(0.003)	(0.011)	(0.003)	(0.005)	(0.002)			
all_phases2	−.111***	−.114***	−.123***	.054**	.058***	.071***	.075***	.100***	.141***	0.057	0.056	0.052
	(0.009)	(0.007)	(0.002)	(0.015)	(0.009)	(0.001)	(0.002)	(0.004)	(0.003)			
all_phases3	−.123***	−.111***	−.111***	.073***	.068***	.066***	.070***	.085***	.121***	0.05	0.043	0.045
	(0.008)	(0.009)	(0.006)	(0.013)	(0.013)	(0.004)	(0.003)	(0.004)	(0.002)			
Interval: +12												
all_phases1	−.089***	−.096***	−.139***	.058***	.065**	.086***	.057***	.077***	.098***	0.031	0.031	0.053
	(0.007)	(0.014)	(0.009)	(0.005)	(0.012)	(0.008)	(0.003)	(0.003)	(0.002)			
all_phases2	−.128***	−.140***	−.168***	.076**	.085***	.111***	.071***	.097***	.140***	0.052	0.055	0.057
	(0.012)	(0.006)	(0.006)	(0.021)	(0.009)	(0.003)	(0.004)	(0.004)	(0.002)			
Interval: +15												
all_phases1	−.086***	−.095***	−.136***	.066***	.076***	.092***	.045***	.064***	.079***	0.02	0.019	0.044
	(0.004)	(0.012)	(0.007)	(0.014)	(0.016)	(0.014)	(0.002)	(0.004)	(0.002)			
all_phases2	−.148***	−.142***	−.180***	.095***	.094***	.121***	.068***	.093***	.137***	0.053	0.048	0.059
	(0.008)	(0.011)	(0.005)	(0.016)	(0.006)	(0.005)	(0.006)	(0.003)	(0.002)			
Interval: +24												
all_phases1	−.072***	−.073**	−.117***	0.068	0.081	.094**	0.015	.023*	.024***	0.004	−0.008	0.023
	(0.010)	(0.019)	(0.010)	(0.033)	(0.038)	(0.029)	(0.008)	(0.010)	(0.003)			

a: computed as minus the impact on Pr(AnyBen) plus the effect on the probability of being in work.
Results from linear probability models. Standard errors are estimated following Donald and Lang (2007), treating a "group" as the interaction of "treatment/comparison" and "cohort". Column headings indicate the proportion of time spent on IS before the start of the observation period by the single parents included in each sample.

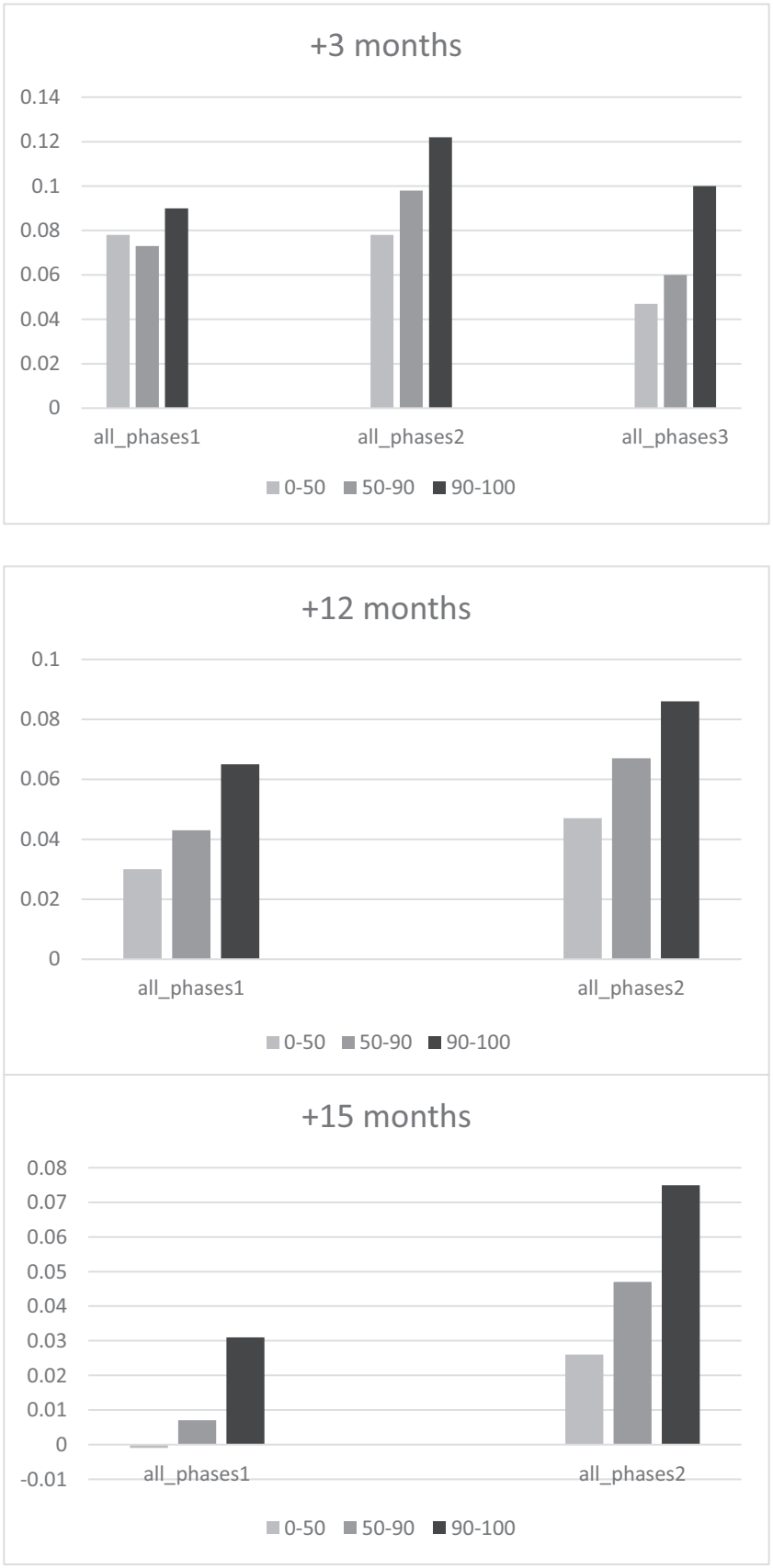

Fig. 6. Difference between the effects of search requirements (i) on the probability of moving onto health-related benefits or non-claimant unemployment and (ii) on the probability of moving into work. Results by proportion of time spent on Income Support prior to the start of the observation period.

comparison of impact sizes is, of course, not an assessment of which policy should be preferred: the two sorts of policies are of a very different nature, not least because one is expanding the choice set of lone parents, and the other is reducing it.

6. Conclusion

This paper presents new causal evidence on the effects of work search requirements on transitions into and out of work and receipt of different welfare benefits for single parents, a growing group of great policy relevance with a historically low level of labour market participation.

We exploit the staggered roll-out of a reform recently implemented in the UK known as "Lone Parents Obligations" (LPO). In a series of discrete jumps, the reform gradually lowered the age of the youngest child which triggers a move from a regime of unconditional income support to a regime with work search requirements. We use a difference-in-difference setting with rich administrative data on benefit receipt and spells of employment, using single parents with younger children as an unaffected group, and using a long span of pre-reform data on single parents with similarly-aged children. The staggered nature of this roll-out provides reassurance that our results are not due to time-varying shocks affecting the treatment or comparison groups.

We show that the introduction of work search conditionalities did increase the flow of single parents into work, and the reform seems to have had larger effects than comparable interventions in the past. However, it also caused a large proportion of single mothers to move onto health-related benefits or into non-claimant unemployment (in the sense that they are not observed either in work or on benefits in our dataset). In fact, the flow towards either of the two states with no work search requirements attached is generally larger than that into work. For example, 9 months after the loss of entitlement to the unconditional income support, the reform has increased the probability that a previously welfare-receiving single parent is in work by about 10pp, but has also increased the probability of receiving either health-related benefits or being in non-claimant unemployment by about 18pp. The nature of this response is related to previous labour market experience: those with lower labour market attachment (proxied for by the fraction of time a single parent has spent on welfare benefits before being affected by the reform) are more likely to move into non-claimant unemployment and particularly onto health-related benefits, than those with stronger labour market attachment.

Overall, these results echo the one of an increase in the proportion of "detached" mothers found in the US (Blank, 2007) and are consistent with the predictions of a simple search model in which individuals with low level of initial search might give up searching and move to other benefits without search requirements (such as the health-related benefits) or enter non-claimant unemployment status (Manning, 2009, Petrongolo, 2009).

Appendix A. Further details on Lone Parent Obligations and other welfare policy changes

A1. Further details on LPO

As part of the LPO changes, single parents are provided with a range of personalised support whilst out-of-work to help move closer to the labour market and into work, as well as post-employment support once they move into work. This includes:

- mandatory Final Year Quarterly Work Focused Interviews, in the year preceding loss of Income Support entitlement.
- A voluntary meeting with an adviser in the weeks before loss of Income Support entitlement, to assist with the changeover to another benefit, such as JSA or ESA.[24]
- Additional flexibilities for single parents claiming JSA in terms of the hours they are required to work, for example.
- Post employment support from an adviser or to cover unexpected financial emergencies in the first months of moving into work.

A2. The jobseekers allowance regime, and sanctions[25]

To be entitled to Jobseeker's Allowance, a lone parent must:

- be available for work for at least 16 h a week.
- Be actively seeking work.
- Enter into a Jobseeker's Agreement with Jobcentre Plus. The Agreement sets out the claimant's agreed availability, including any restrictions on their availability for work; the steps the claimant intends to take to look for work; and the range of help to be provided by Jobcentre Plus to help them find work.

Continuing entitlement is conditional on attending fortnightly meetings with an advisor. Failure to meet these conditions can lead to Jobseeker's Allowance to be disallowed. Payment of the benefit can also be suspended ('sanctioned') for a period of time in various situations, including where the claimant:

- Left their job voluntarily without good cause or lost their job through misconduct.
- Refused, failed to apply for or accept a job, without good cause.
- Neglected to avail themselves of an employment opportunity.
- Refused to carry out a 'jobseeker's direction' (i.e. an instruction from a personal advisor).
- Refused, failed to apply for or failed to attend a compulsory training scheme or employment programme.

The length of a sanction depends upon the situation, but can be for up to 26 weeks. During this period, JSA would not be paid at all; other benefit entitlements would not be affected. The number of sanctions as a ratio of the number of recipients is shown in Fig. A1.

A3. Other welfare policy changes

Other policy changes will confound an impact evaluation if they affect the treatment and comparison groups differently. In such a case, the 'common trends' assumption underpinning the difference-in-differences methodology would not hold . In this appendix we discuss some relevant policies in more detail.

JSA and Flexible New Deal (FND): In April 2009, the JSA regime changed, with a policy known as Flexible New Deal (FND), which affected the support available to all JSA claimants. This initially applied in certain Jobcentre Plus districts, with the remaining districts affected from April 2010. The estimated impacts of LPO do not take explicit account of FND, but the DiD regressions do control for Jobcentre Plus district to allow for any differences at district level, and for these to change over time, as a way to account for the gradual roll-out of FND. This also means that the overall estimated impacts are effectively averaged over areas with and without FND.

Incapacity Benefit (IB) and Employment and Support Allowance (ESA): ESA replaced Incapacity Benefit (IB) for new claimants from October 2008, just before LPO began. ESA claimants have to undergo a Work Capability Assessment to assess whether their health condition limits the work they are able to undertake. Single parents on IS before the introduction of ESA and who may have had a work-limiting health condition may have a strong incentive to claim IB before October 2008, after which date IB was closed to new claimants, rather than wait until the end of their IS entitlement and make an ESA claim. The estimated

[24] Jobcentre Plus districts also had to run 'Options and Choices' events in the year LPO was introduced, informing single parents about the changes and the support available to them, after which they had the discretion to run events if they considered there to be a need for them.

[25] We draw on Kennedy (2010).

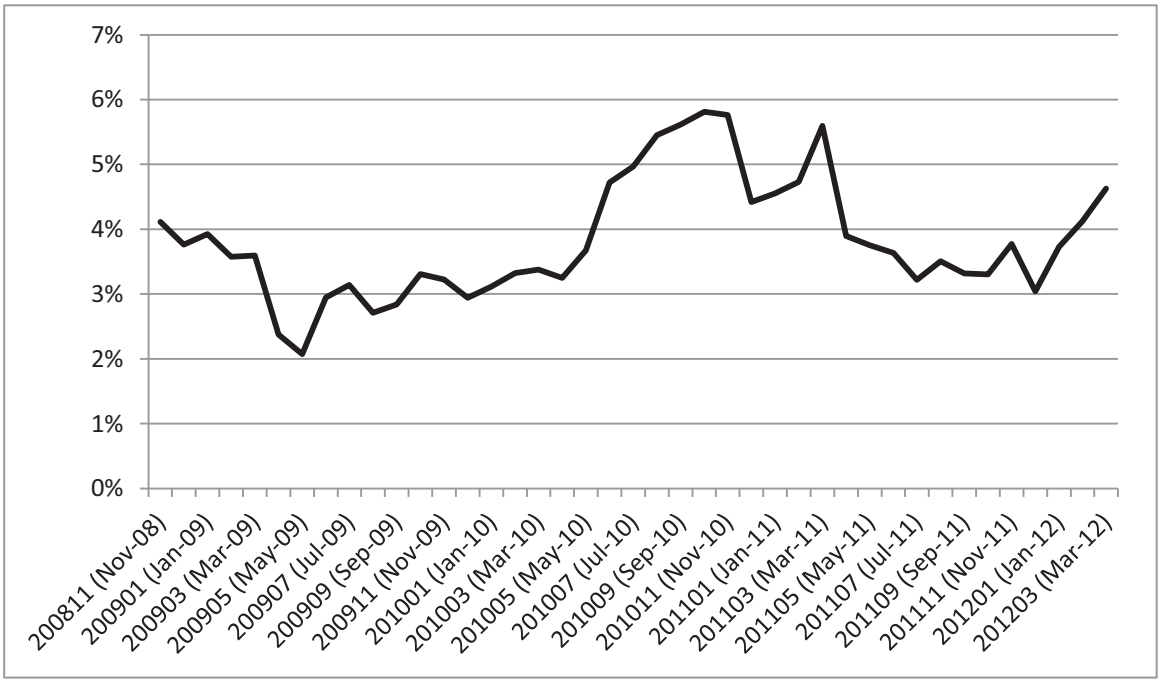

Fig. A1. Number of sanctions applied to lone parents receiving JSA as fraction of lone parents receiving JSA, by month.
Source: authors' calculations based on data from StatXplore (https://stat-xplore.dwp.gov.uk/webapi/jsf/dataCatalogueExplorer.xhtml) and available from authors on request.

impacts of LPO do not separate out this impact from the impact of LPO. It is expected that the introduction of ESA would have mostly affected the early sub-phases of LPO, and might have resulted in greater than expected moves from IS to IB.

In Work Credit (IWC) roll-out: In Work Credit, a payment of £40 a week (£60 in London) for the first year of work (16 h and over a week) for single parents who had been receiving IS or JSA for at least a year, was available nationally between April 2008 and October 2012 . It was previously available in certain Jobcentre Plus districts, covering around 45% of single parents receiving IS. Therefore, the change in April 2008 affected only single parents in districts that did not previously have IWC, but in these areas, the national roll-out of IWC affected the treatment and comparison groups equally. The estimated impacts of LPO take no account of IWC, but the DiD regressions do control for Jobcentre Plus district to allow for any differences at district level, and for these to change over time, as a way to account for the gradual roll-out of IWC.

The Work Programme: The Work Programme began in summer 2011 and replaced Flexible New Deal and most other New Deal employment programmes. Therefore, up until 30 September 2011 (the end point for this analysis), it is possible that a small number of single parents may have entered the Work Programme during this time. However, it was not possible to determine this from the data used for this analysis. The estimated impacts of LPO, therefore, do not separate out any impact of LPO from the impact of the Work Programme; equivalently, the overall estimated impacts are effectively averaged over those few single parents who were affected by the Work Programme and the many who were not.

Appendix B. Fraudulent claims of welfare benefits

The main means-tested welfare benefits and income-related tax credits in the UK are assessed on the joint income of a married couple, or of a cohabiting couple who are "living together as husband and wife" (this is the phrase used in legislation; its meaning has been established through social security case law and practice). Many couples who are receiving means-tested welfare benefits and income-related tax credits would have a higher entitlement to welfare or tax credits if they were to claim (falsely) that only one adult was living in the household: this arises when any additional entitlement due through the presence of another adult is more than offset by the loss of entitlement through the means-test taking into account that other adult's own, private income. This phenomenon is sometimes referred to as the "couple penalty": see Adam and Brewer, 2010, for example (which we draw on here).

Based on random audits, the relevant government department estimates that, during the financial year 2008–9, it wrongly paid out £93 million in income support to working-age claimants fraudulently not reporting the presence of a co-resident partner. This represents around 2.9% of the total spending of Income Support for single parents (amount of fraud from Table 6.1 of DWP, 2009a; denominator derived from Table 9 of DWP, 2009b); the DWP estimates that all types of fraud increased its spending on Income Support for single parents by 4.7% (Table 9 of DWP, 2009b). The equivalent figures for those on income-related tax credits are considerably higher: HMRC estimates that 7.5% of the claims for tax credits by a single parent contained fraudulent or incorrect non-reporting of the presence of a partner, and these claims were worth £580 m (see Table 8 of HMRC, 2010a, for the amount of fraud and Table 2.1 of HMRC, 2010b for the denominator).

Appendix C. Further details on cleaning and using the WPLS data

C1. Resolving inconsistencies between start and end dates of claims and spells in the IS history file

The IS History file contains information on IS claims, and the spells within them. Each row in the dataset records information relating to a specific "spell", where a spell within a claim should correspond to a period of time within which the claimant's circumstances were unchanged (and so a new spell should accompany a change in the claimant's circumstances).

The dataset presented a number of inconsistencies, both between and within claims. These included overlapping spells within a claim, or gaps between spells within a given claim. These inconsistencies were resolved following systematic rules, summarised in the remainder of this appendix. The rules were informed by two principles:

(a) The start-of-claim dates were assumed reliable, meaning that only end-of-claim dates were adjusted to solve inconsistencies.
(b) Within a claim, any pair of spells with consecutive dates (i.e. when the end date of spell n is one day earlier than the start date of spell n + 1) were considered more reliable than other, possibly conflicting, spells.

These are the steps taken in cleaning the IS history file:

(1) Spells that appear to be identical duplicates were dropped from the dataset.
(2) End-of-claim date:
a. Sort the spells within a claim by start date and end date.
b. Consider the "Maximum Claim Date" associated with the last spell(s).
c. Set the maximum value as the End of Claim date.
d. If there is no "Maximum Claim Date", set the Claim as ongoing.
e. Adjust the end-of-claim date to avoid an overlap with any following claim.
(3) The end of each spell is constrained to be less or equal to the end of claim.
(4) The start date of all first spells (within a claim) is constrained to be equal to the start of claim.
(5) When there are conflicting "last spells" (multiple spells with the same start date which appear at the end of the claim):
a. Select the one for which end of spell is the same as end of claim.
b. If there are none, take the one with minimum difference between end of spell and end of claim.
c. If either of the two previous steps gives multiple candidates, the candidate last in order is kept as the "last spell of the claim".
(6) Identify all the spells within a claim that appear consecutive (they are only one day apart) even if they do not appear adjacent in the dataset when the dataset is sorted by start of claim, start of spell and end of spell.
(7) Within each claim, start from the first spell with at least one consecutive spell and apply the following rules:
a. If the spell only has one successive consecutive spell, this latter is selected.
b. If the spell has multiple consecutive spells, select the one which has a consecutive spell itself. If more than one has consecutive spells, select the first one. If none has a consecutive spell, select the first one as well.
c. Now all spells which are in between two selected consecutive spells are dropped.
(8) In case of gaps between spells, extend the end date of the earlier spell forwards in time.
(9) In case of overlaps between spells, take back the end date of the earlier spell.
(10) The few spells which end up with negative duration are dropped.

C2. Measuring the date of birth of youngest child

A very important step of the analysis of this study is to select the single parents affected by LPO in different sub-phases. Whether and when a single parent is affected by LPO depends on the date of birth of their youngest child. The IS History file does provide information on the date of birth of youngest children, but there are often changes in the date of birth of youngest children which appear implausible (both in the pattern and in the number of changes) and which are very likely to be the result of reporting or recording errors. The following rules were followed to derive a consistent value for the date of birth of youngest child:

(1) The (relatively few) claims which were associated with more than 3 changes in date of birth of youngest child were dropped. In the vast majority of cases these were self-evidently mistakes (for example, when four different date of births were recorded with the same day and month but varying years).
(2) The two most recent date of births were selected (note: not necessarily the two most recently reported ones).
(3) If the earlier of the two selected dates of birth implied that the single parent should be included in a given group, then that was selected as the relevant date of birth.
(4) If a single parent was not eligible for inclusion in a given group based on the earlier date of birth, it was checked whether she would be eligible based on the more recent date of birth.

C2.1. Using the tax credit data set to measure whether working 16 or more hours

The extract of data on tax credits contained information of spells of entitlement to the working tax credit (WTC), spells of entitlement to the child tax credit (CTC) and information on hours worked per week. Within the spells of entitlement to WTC and CTC, there were sub-spells corresponding to entitlement to the different elements of WTC and CTC. There were inconsistencies within and between all these pieces of information. For example

- within a spell of entitlement to WTC, it was possible to find people entitled to no elements of WTC (which should not happen) as well as people entitled to both the "single parent" and the "second adult" element (which is clearly not possible).
- Spells of entitlement to CTC did not always match spells of entitlement to WTC.
- Information on hours worked was not always consistent with spells of entitlement to WTC.

In this report, the measure of work was taken from the spells of hours worked reported by single parents, and not from the spells of entitlement to WTC.

Appendix D. Further analysis and descriptive evidence

D1. Characteristics of those single parents remaining on IS

This sub-section analyses the characteristics of those single parents who remain on IS after the predicted date of loss of IS entitlement.

About 10% of single parents in the sample were still receiving IS six months after the date on which they were predicted to lose IS entitlement. There are three reasons why this could occur:

- It could reflect that the single parent is exempt from LPO.
- It could reflect inaccuracies in the data which mean that either the date on which they should have lost IS entitlement is wrongly predicted, or the data wrongly suggests that they have not left IS when in fact they have.
- It could reflect a mistake in the operation of the LPO policy in practice indicating they should have lost entitlement to IS, but didn't.

Tables 1 and 2 provide breakdowns for the following mutually-exclusive categories :[26]

- Receiving Carer's Allowance along with IS.
- Receiving IS but not as a single parent, either because the claim is now from a couple, or because there are no dependent children.
- Receiving IS with a younger child
- Receiving Incapacity Benefit along with IS.[27]
- None of the above, ie there was no identifiable reason why the single parent was still receiving IS.

Overall though, there was no identifiable reason why the single parent was still receiving IS in around a third of cases (across phases).[28]

[26] If more than one was applicable, single parents were placed in the first category.
[27] Single parents receiving IB when sampled were excluded from the sample, because they were exempt from LPO. The single parents in this category, then, must have started a claim of IB in the 12 months preceding the date when they would have lost IS entitlement, something which was possible only for single parents affected by Phase 1 of LPO.
[28] There are some categories of single parents that were exempt from LPO that cannot be identified in our data.

Table 11
Reasons for remaining on IS after date when predicted to lose IS entitlement, Phase 1.

	18 months after sampled (6 months after IS end date)	27 months after sampled (15 months after IS end date)	36 months after sampled (24 months after IS end date)
Receiving Carer's Allowance	23%	29%	31%
No longer a single parent	3%	4%	7%
With a younger child	9%	9%	8%
Receiving ESA/IB/SDA	28%	27%	27%
No apparent reason	37%	31%	27%
All cases	100%	100%	100%
(as fraction of all potentially eligible)	15,757 (14%)	14,756 (13%)	12,284 (11%)

Table 12
Reasons for remaining on IS after date when predicted to lose IS entitlement, Phase 2 and 3.

	Phase 2 18 months after sampled (6 months after IS end date)	27 months after sampled (15 months after IS end date)	Phase 3 18 months after sampled (6 months after IS end date)
Receiving Carer's Allowance	37%	44%	27%
No longer a single parent	1%	1%	1%
With a younger child	24%	21%	36%
Receiving ESA/IB/SDA	1%	1%	<1%
No apparent reason	36%	32%	36%
All cases	100%	100%	100%
(as fraction of all potentially eligible)	8619 (10%)	5364 (8%)	13,390 (8%))

Amongst Phase 1 single parents, very few continue to receive IS because they have since had another child, but some continue to receive IS as single adults (this could happen if they claimed the pre-2008 disability benefit, known as Incapacity Benefit (IB)). In Phase 2, slightly more had started a claim for Carer's Allowance and slightly fewer were no longer single parents. Compared to Phase 1, more parents in Phase 2 were observed to be receiving IS and having a younger child. For single parents in Phase 3, there was no identifiable reason why the single parent was still receiving IS in around a third of cases, with roughly equal fractions of the remainder having started a claim of Carer's Allowance or having had a younger child.

D2. Single parents who are not in work and not receiving any out-of-work benefits

Fig. 7 shows what fraction of these (possibly former) single parents fall into one of the following mutually exclusive categories :[29]

- working fewer than 16 h/week themselves, but living as a couple that was entitled to WTC due to their partner working at least 16 h/week
- recorded as entitled to WTC as a single adult but without reporting work of 16 or more hours (this would suggest an inconsistency between the data on "entitlements to WTC" and the data on hours worked recorded in the tax credit administrative data).
- receiving Child Tax Credit and working fewer than 16 h/week.
- receiving no other working age benefits or tax credits in their own right

The figure shows that (across the 3 Phases) between 70% and 90% of this group are either not receiving any state support or receiving only child tax credits.[30] However, amongst those appearing to receive no state support it is not possible to tell, how many no longer have a dependent child (something that substantially reduces entitlements to benefits) or how many have re-partnered but without claiming tax credits. It is also not possible to tell whether any of these (former) single parents went on to be the partner of a claimant of an out-of-work benefit.

Appendix E. Comparison with other programmes for single parents in the UK[31]

Comparison of our estimated effects with those of other programmes is complicated by the variation in outcome measures and population of interest. We therefore focus on just on evaluations of programmes aimed at single parents in the UK, and we have also to focus on the impact on receipt of IS, as earlier studies could not look at the impact on employment, and did not systematically consider the impact on health-related benefits.

Our headline estimates are that LPO reduced the fraction of single parents receiving an out-of-work benefit by −12.8 at nine months (in Phase 1), and by −15.7 at nine months in Phase 2. These are considerably higher than the estimated impacts of three previous UK reforms affecting single parents receiving welfare benefits:

- The estimated impact of the Lone Parent Pilots (a set of reforms dominated by a back-to-work bonus of £40 a week for the first 52 weeks of work) amongst lone parents who had been on IS for 12 months was 1.6 ppts after 12 months, and 2.0 ppts after 24 months (Brewer et al., 2009).
- the estimated impact of a reform known as Work Focused Interviews (WFI), which required single parents on welfare to meet with a case-worker at 6 or 12 month intervals; after 12 months, was 0.8% for single parents with youngest children aged over 13 and 2.0% for single parents with youngest children aged 9–12 (Cebulla et al., 2008).
- The estimated impact of the New Deal for Lone Parents (NDLP), which offered a voluntary programme of work search counselling amongst all single parents (not just those who participated) on IS was 1.7 percentage points after nine months and 1.4 percentage points after 24 months (Cebulla et al., 2008).

Of these interventions, two are mandatory (WFIs and LPO) and two were voluntary programmes (NDLP and IWC). Of the mandatory interventions, LPO is clearly much more effective at moving single parents

[29] Single parents were put into the first category that applied.

[30] It is not possible to tell, amongst those appearing to receive no state support, how many no longer have a dependent child (something that substantially reduces entitlements to benefits) or how many have re-partnered but without claiming tax credits. It is also not possible to tell whether any of these (former) single parents went on to be the partner of a claimant of an out-of-work benefit.

[31] This draws on chapter 5 of Avram et al. (2013).

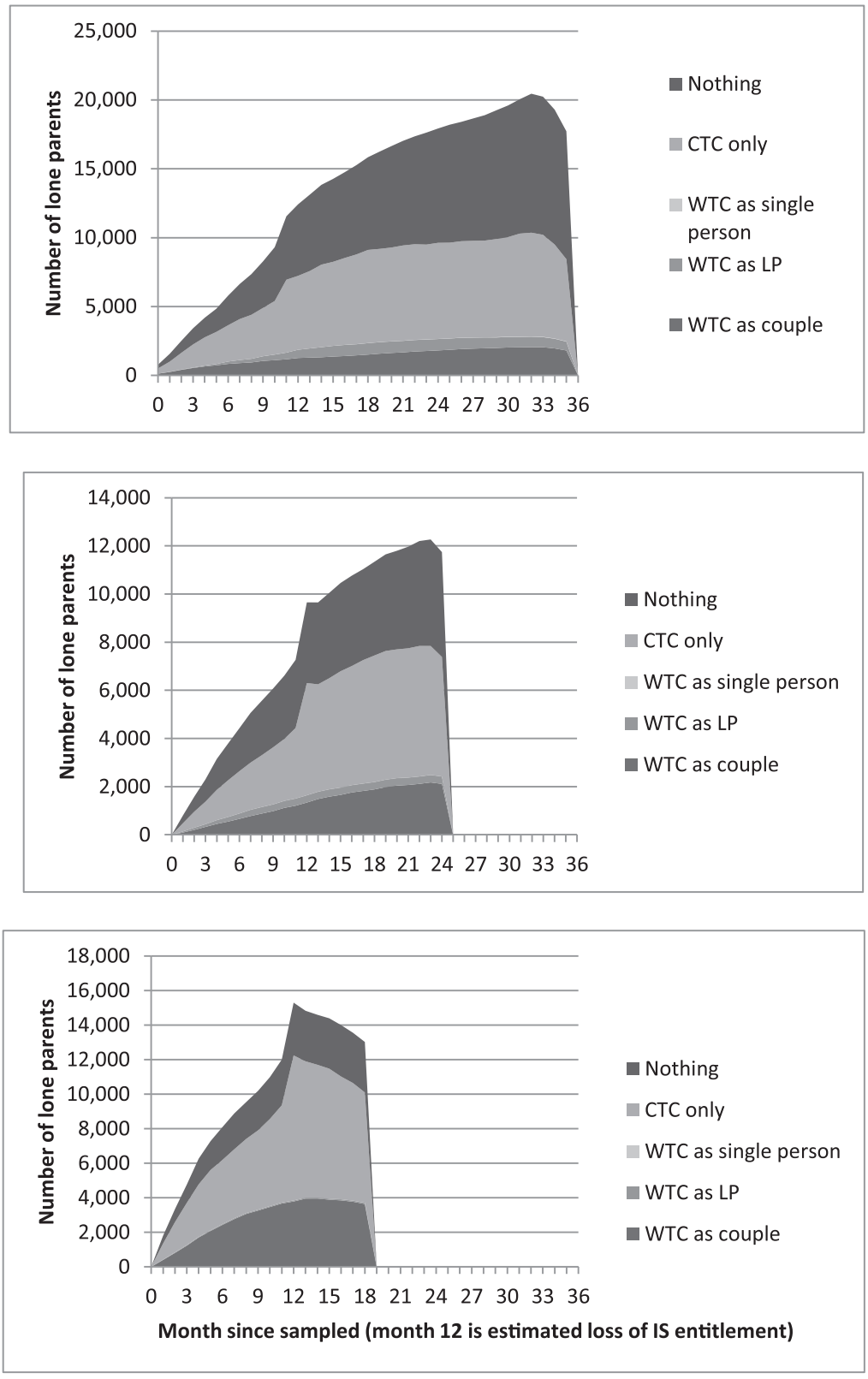

Fig. 7. Outcomes for single parents not receiving any of ESA/IB/SDA, CA, IS, JSA and not reporting work of 16+ hours when claiming tax credits, by Phase (top = Phase 1, bottom = Phase 3).

off out-of-work benefits and into work than are WFIs. This is fully in line with the considerable difference in intensity (and conditionality associated with different benefits) underpinning the two interventions. The two voluntary programmes have higher estimated impacts amongst their participants, but this is not the relevant way to measure their effectiveness when compared with a mandatory programme like LPO.

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