Welfare-to-Work, Wages and Wage Growth

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ABSTRACT

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This paper attempts to uncover the effects of a welfare-to-work programme that acts as a wage subsidy on wage growth by exploiting an expansion to this welfare programme in the UK. The conventional wisdom is that such programmes trap recipients into low wage, low quality work – this comes from the simple argument that the "poverty trap", which a wage subsidy for low income workers induces, reduces the benefits to on-the-job training and so reduces wage growth. In fact, a wage subsidy will also reduce the costs of general training because we would normally expect workers to pay for their own general training in the form of lower gross wages. So a wage subsidy is a way of sharing these costs with the taxpayer. Thus, the net effect on wage progression depends on whether it reduces costs by more or less than it reduces the benefits.

The paper uses Labour Force Survey panel data to look at wage levels and growth in the UK before and after Working Families' Tax Credit (WFTC) replaced Family Credit (FC). We exploit nonlinearities in the system and overall, we find that wage growth for those on WFTC exceeded wage growth for those on FC, although for those already on the programme wage growth declined, reflecting the fact that under WFTC the wage growth is implicitly taxed over a wider range of wages.

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1.   Introduction

In-work welfare programmes aim to improve incentives for people without work to move into employment. From 1998 to 2003, in the United Kingdom, the Working Families' Tax Credit has been one such income supplement programme. Similar programmes have existed in the UK since 1972 and the Earned Income Tax Credit, which was introduced in 1975, plays a similar role in the United States. The WFTC was part of a range of policies that attempt to "make work pay", but its proximate aim was to provide earnings supplementation for working low-wage families with children and so reduce child poverty. The role of in-work welfare in the UK has recently been extended since Working Tax Credit (WTC) has very recently replaced WFTC and extended eligibility to those on low incomes without children.

Economic assessments of welfare programmes tend to be concerned with the work incentive effects that operate via their impact on *net* incomes. Such research on EITC in the US (see, for example, Eissa and Leibman, 1996) and FC in the UK (see, for example, Blundell *et al* (2000) and Brewer *et al* (2003a)) has suggested that such policies are indeed effective at encouraging individuals to work.

However, little attention has been given to the quality of the jobs that are obtained. Indeed little attention has been given to the effects of such policies might have on the structure of *gross* wages faced by individuals in the economy. The aim of this paper is to consider how such incentive effects would impact on wages, and the growth in wages, of a given individual.

Blundell and Walker (2001) mentioned a variety of reasons as to why income support programmes might affect the wage levels, and their rate of growth, of programme participants. Since welfare transfers in in-work welfare programmes are typically means-tested they explicitly serve to subsidise low wage work. To the extent that low skilled labour is inelastically supplied we would expect any increase in the supply of unskilled workers arising from the programme to be accompanied by an decrease in gross wage rates faced by all unskilled workers and the size of this decrease would depend on the elasticity of labour demand. The fear that some part of a subsidy to the supply-side will be captured by the demand side of the market has often been expressed but we can find no estimates of such an effect. The tax incidence literature gives mixed messages – work by Gruber (1997) exploited a natural

experiment in Chile where a payroll tax was imposed on some firms but not others showed that gross wages were unchanged; while work by Bingley and Lanot (2002) exploited differential local tax changes across Denmark and showed that around half of the change in tax induced change in net wages were compensated for by offsetting changes in gross wages[1]. In the UK it was partly because of a fear that the increased generosity of WFTC (compared to FC), and the change in its administration that would explicitly inform employers which workers were on WFTC, that resulted in the WFTC reform being introduced after the minimum wage was in place – the minimum wage would reduce the possibility of firms being able to appropriate some of the benefits of the subsidy to reduce their gross wage bill.

Welfare recipients could also, and independently, experience lower rates of wage growth if their returns to wage enhancing investments are reduced from being on welfare. The lower return is due to the fact that WFTC was means tested. For example, take an individual on WFTC who faced an average marginal income tax rate of 22% and paying national insurance at 10%. If this person was receiving the maximum amount of WFTC for which they were eligible, then their implicit tax rate is no different from someone who were not on WFTC, i.e. 32%. However, if this person was on the WFTC taper (i.e. they lost 55 pence of every pound of WFTC for net earnings above the threshold) then they faced an implicit tax rate of 69% (= 0.32 + 0.55*(1.00-0.32)).

The existing empirical literature focuses on the impact of net constraints on short run (labour supply) behaviour – only Card *et al* (2001) and Gottschalk and Connolly (2002) has considered the long run implications for wage growth. The theoretical case for thinking that there is a long run impact on wage growth is through incentives to invest in on-the-job training. If this has some "general" training component to it that is not entirely firm-specific then conventional arguments suggest that the employee should pay for this in the form of reduced wages and that the costs are recouped in the long run when higher wages would be forthcoming. That is, we should observe rapid wage growth associated with training, formal or informal, and the incentive to engage in this is affected by the presence of the wage subsidy.

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[1] See also Leigh (2003) for the incidence of EITC in the USA.

While we are used to thinking that low skilled workers enjoy little or no wage growth recent evidence in the US suggests otherwise. In fact, low skilled workers seem to have a return to experience that is at least comparable with that of skilled workers[2].

However, the arguments above rely on a competitive labour market were workers are always paid their (gross) marginal products. There are several reasons why the wages of workers may depart from their marginal products. For example, the productivity of workers may not be apparent when they are hired and there may be reasons for having delayed compensation that pays workers more than their marginal products once they have acquired significant human capital that is, at least partly, job-specific.

A second source of market imperfection comes from the credit market where it has been noted elsewhere, in the context of higher education, that it is difficult to borrow against human capital. Thus, low skilled individuals may be deterred from accepting jobs which feature general training, even though that training might have a large rate of return, because the starting wages are below their reservation wages. Thus, in the presence of credit market constraints, the effect of WFTC might have been to encourage low skilled workers to accept offers of jobs with very low starting wages and enable them to enjoy the resulting wage growth associated with the accompanying on-the-job training. That is, WFTC may have acted as a subsidy to on-the-job general training and so raise the rate of return to it and help overcome any credit constraints that limit participation in jobs that have good long-run prospects but limited early wages[3]. On the other hand, although WFTC may have subsidised the costs of human capital accumulation for low skilled individuals it may also have "taxed" the subsequent returns. Whether the net effects of WFTC on the probability of accepting such jobs was positive or negative depends on the degree of progressivity of the system and here WFTC was, itself, ambiguous because the system was locally progressive at very low levels of wages (because the system featured a maximum entitlement where the taper was locally zero, followed by a range of wages over

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[2] See, for example, Gladden and Taber (2002).

[3] The theoretical arguments are not, however, quite this simple in a world where labour supply is itself a choice variable. Suppose WFTC encouraged individuals to work longer hours when their wages had grown sufficiently that they were no longer entitled, then this would increase the utilisation rate of human capital and thereby increase the return to it.

which a 55% taper applied) AND it was locally regressive at higher levels of wages (where entitlement ended and the taper therefore dropped from 55% to zero[4]).

This paper is one of a small number to consider how in-work income support programmes might impact on individual wage growth. Our analysis is more complex than earlier studies of the Canadian SSP experiment because of the features of WFTC/FC. We find, perhaps surprisingly, that people on the in-work welfare taper had, on average, somewhat higher wage growth than those in work but not on in-work welfare who were otherwise similar. Those on the welfare programme but receiving the maximum experienced lower wage growth than otherwise similar people who were not on the programme.

The rest of the paper is outlined as follows: section 2 gives the background to the income support programmes in the United Kingdom, and also presents the relevant literature; section 3 presents the data use in the analysis, the quarterly rolling panel from the UK Labour Force Surveys (LFS); section 4 summarises the wage growth of welfare recipients according to certain characteristics including the relevance of job mobility. Finally, in Section 5 we present results which exploit the "natural experiment" that the FC to WFTC reform provides. Section 6 concludes with some observations for future research.

2. Background and Literature

2.1 Income Supplement Programmes in United Kingdom.

In the United Kingdom there has been a system of financial support for working families since the early 1970s. The Family Income Supplement (FIS) was introduced as a means-tested benefit in 1971. In 1988 the hours and earnings thresholds for eligibility were relaxed and the programme was renamed Family Credit (FC). In October 1999 Family Credit was replaced by Working Families' Tax Credit which had a similar structure to FC but featured larger entitlements. Despite the difference between each of the separate programmes of in-work support, they all share a common goal to alleviate poverty while at the same time not creating adverse work incentives, and perhaps creating positive work incentives (see Blundell and Walker (2001) for WFTC and Bingley and Walker (1997) for the earlier FC programme).

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[4] The problem is further exacerbated by the interaction with the income tax, social security contribution system and other aspects of the welfare system.

The data we use in this paper, the UK Labour Force Survey, for 1997-2003, bridges the FC and WFTC periods. We discuss the differences between each of the programmes below.

2.2 The Structure of Family Credit and the Working Families' Tax Credit

In order to be eligible for FC or WFTC a family with dependent children needed to have one adult working a minimum of 16 hours per week[5]. A family was eligible for a maximum amount which depends on the number of dependent children in the family, plus a small bonus if at least one parent worked full-time (greater than or equal to 30 hours per week). Under FC, the maximum amount was payable if the family's net income was lower than a threshold amount, which was £80.65 per week immediately prior to the change-over to WFTC in October 1999. The taper for net income in excess of the threshold amount was 70 pence for every £1 in excess of threshold income. The value of the credit also depended on household savings: savings over £3000 reduced the award, while savings over £8000 made the family totally ineligible. FC was payable at a flat rate for six months, regardless of changes in the family's circumstances in the intervening period. This fixing of the payment period for FC was set so as to reduce administrative and compliance costs. FC was also paid to mothers (if requested) even if eligibility was in respect of the father's earnings[6]. Using data from the Labour Force Survey, we find an average (real) payment over the January 1997 - October 1999 period of about £56 and the average of the last quarter was close to £63, the same as administrative data shows. We estimate the take-up rate for FC for the same period to be 45%[7].

Starting in October 1999, FC was replaced with WFTC. The reformed programme was substantially more generous. In August 2001 there were 1.271

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[5] A dependent child is one who is under 16 years of age, or under 19 if in full-time education up to A-level or equivalent standard.

[6] The structure of FC and WFTC created some perverse incentives. For example, there was clearly an incentive for an individual to get a relatively low-paying job in order to qualify for FC/WFTC, and then in the intervening 6 months get a much better job while continuing to receive it. We attempt to control for this in the analysis by separating out those individuals who change jobs from those who remain in the same job.

[7] This is considerably lower than the published take-up rate of 69% which includes non-entitled recipients in the numerator. However, it is consistent with other estimates of the take-up rate obtained using the Labour Force Survey (see Brewer, *et al.* (2003b) which considers several explanations for the difference in estimated take-up rates, the most obvious being that fact that they are measures of take-up in different time periods.

million families receiving WFTC, compared with 817 thousand families receiving FC in August 1999. In addition, the average reward had increased to about £82 per week by August 2001[8]. The difference in the number of families on FC and WFTC was not, of course, entirely due to the reform of the welfare system, some of the changes may also be associated with the wider economy.

The increased generosity of WFTC relative to FC came about due to four major changes: an increase in the support payable; an increase in the earnings threshold for eligibility from £80.65 per week to £90 per week; a reduction in the taper off welfare from 70% to 55%; and a childcare tax credit of 70% of eligible childcare costs up to a maximum of £150 per week that replaced FC's partial childcare disregard[9].

The largest cash gains as a result of the move from FC to WFTC went to those people who were at the end of the taper on FC. Individuals who were receiving the maximum credit saw a small increase in the level of their payment. A number of individuals also move from being on the taper to being on the maximum. However, as noted above, the largest cash gains went to those individuals who were just at the end of the FC taper, for whom the WFTC reform created a new and large entitlement to in-work support.

2.3 Comparisons with Other in-work Benefit Systems

Several countries have relied on tax credits and/or employment/wage subsidies in their welfare-to-work programmes. In this section we discuss programmes in the US (the Earned Income Tax Credit) and Canada (the Self Sufficiency Project). The majority of research on welfare receipt and wage growth has used data from programmes in these countries[10].

The Earned Income Tax Credit (EITC) was introduced in the US in 1975 and is one of the oldest income support programmes in the world. As with the move from FC to WFTC, the EITC was reformed in several tax acts throughout the 1980s and

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[8] Statistics are taken from the Inland Revenue Quarterly Statistics on the WFTC and FC, August 2001 and August 1999. Unfortunately LFS ceases to report the amount of WFTC/FC received in late 1999.

[9] With regard to the childcare tax credit, in August 2001 it was estimated that approximately 12% of all recipient families had a childcare tax credit included in their reward, the average amount of which was just £37.50 per week.

[10] Gradus (2001) reviews schemes that have been proposed and that are already operating in several European countries.

1990s that greatly increased the scope of the programme. Individuals are assessed for EITC eligibility on the basis of the taxpayer's income and the number of qualifying children. However, unlike the UK system of in-work benefits where the maximum entitlement occurs at the bottom of the earnings distribution (subject to a minimum level of hours worked), the EITC has both a phase-in schedule, at 40%, and a phase out schedule, at 21%. This results in a somewhat smoother budget constraint than the one we observe for FC or WFTC[11]. Also unlike the UK system, the EITC is based on an individual taxpayer's income, and not the family income. Most of the work on the labour market impact of the EITC has concentrated on the labour supply effects (see Blundell (2000) and references therein) and much of this research exploits the reforms of the programme that occurred throughout the 1980s and 1990s as natural experiments.

The Canadian Self-Sufficiency Project (SSP) was a federally-funded *experiment* designed to determine the effectiveness of using earnings supplements to reduce the long-term dependence of welfare recipients. The programme is discussed and analysed in Card *et al* (2001) and Connolly and Gottschalk (2002). Both of these papers consider the wage growth effects of the welfare programme, and we discuss their results in the literature section below.

From an economic evaluation perspective, the SSP is a well designed experiment. However, certain parts of the design differ greatly from programmes operating in the UK. These design issues lead to differences in the incentive structure of the three programmes that make direct comparisons between them difficult. The SSP, which began in the mid-1990s, was available to single parents with 12 months of unemployment welfare history who could find a job that averaged 30 hours per week over a one-month period. Individuals who did not satisfy the eligibility requirements did not, however, lose all welfare assistance as programme participation did not alter the income assistance (i.e. their unemployment benefit) level.

Supplementary payments were based on earnings and were 50% of the difference between the participant's monthly earnings and a target earnings level in that period. The target earnings level, like the earnings threshold in FC/WFTC, were set so as to provide adequate income support while also creating positive incentives

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[11] See Brewer (2001) for a detailed analysis of differences between WFTC and EITC.

for work. The exact figures are given in Connolly and Gottshalk (2002). The rule for supplementary payments implies an implicit taper of 50% against any increase in earnings, which could either result from an increase in hours, or searching for a job with a higher wage.

The major difference between SSP and the UK programmes concerns the time-frame in which the individuals have to claim the credit. From the time of eligibility each participant has 12 months to take up the assistance. From that point they can only claim the benefit for a maximum of 36 consecutive months. This creates a significant incentive for respondents to obtain higher wages by working harder or searching for better paid jobs, otherwise they face a significant fall in earnings at the end of 36-months. That is, SSP support is strictly time-limited and it seems likely that this sets up strong intertemporal substitution effects. In contrast, FC/WFTC programmes support is such that an individual can receive the cash for as long as they meet the qualifying conditions[12].

2.4 Literature on Wage Growth

In this section we summarise the economics literature on wage growth. We look at both the general literature as well as papers that specifically address the impact of welfare receipt on wage growth. The papers are all closely related, in that the general determinants of wage growth, such as training and job mobility for example, are also affected by welfare receipt.

Why do wages rise over a career? Over the past few decades a significant body of economics literature has emerged that attempts to answer this question. In this section we summarise the results of this research and consider how an individual's welfare status will inform any priors we have about their wage growth. Broadly speaking, we can attribute wage growth to three sources: the accumulation of labour market experience, the accumulation of job tenure (seniority), and movements up the wage distribution through job mobility. However, the lack of adequate data to analyse such complex economic behaviour has lead to a considerable debate over the relative importance of each factors.

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[12] However, given that the average duration on FC/WFTC ranges from 19 months (couples) to 22 months (lone mothers), this may not be such a significant issue (data from the Inland Revenue Quarterly Statistics on FC/WFTC).

The standard neoclassical explanation for the fact that wages rise with tenure is that individuals receive firm specific training that is productive and thus their marginal product and wage rises over time. Since the firm's spending on training declines as workers age, the gap between the wage and the value of the marginal product declines. Several papers have attempted to estimate the size of the real rate of return to tenure. For the US, the estimates of the return to tenure range from about 0.6% per year (Abraham and Farber, 1987) to 2.5% per year (Williams, 1991; Brown, 1989; Topel, 1991). The average returns to experience have been estimated at around 2% per year (Williams, 1991).

The estimates vary considerably depending on whether or not the authors confront a number of econometric problems that arise when estimating wage change equations. The two main issues are discussed in detail in Altonji and Williams (1998). Firstly, permanent differences across individuals in wage rates are likely to be correlated with heterogeneity in mobility. Secondly, endogenous mobility decisions induce spurious correlations between labour market experience, job tenure and job match quality. Clearly using cross-section data to analyse the determinants of wage growth is futile. The situation is much improved if one uses panel data. Zangelidis (2002) uses panel data to look at the wage growth of a group of UK workers over time. He finds that the unobserved individual characteristics and job-match effects are correlated with both employer tenure and labour market experience, which leads to estimates of both these slope effects that are biased upwards. After eliminating the bias, through both instrumentation and differencing, the author finds an average return to *ten* years of tenure of just 7%.

Wage growth due to job mobility is closely related to the literature on job matching. The wage growth premium due to mobility can also be attributed to improvements in the match between a worker's skills and the requirements of a job. Gottshalk (2001) compares the wage gains of US workers who are consistently working for the same employer and those who change employers. In order to deal with the endogeneity that arises when individuals stay in jobs that are better matches, Gottschalk assumes a linear approximation of matching process – so the (log) wage increases linearly with tenure in the job. The econometric method we use below follows a similar approach, although we use prior information to impose further constraints on the unidentifiable parameters (Altonji and Williams (1998)). Gottschalk

finds that mean wage growth between jobs is large in comparison to wage growth while working for the same employer. He notes that the results vary considerably by schooling, skills and gender, with male workers who are less educated having the largest wage growth premium.

2.5   Literature on Wage Growth and Welfare Receipt

We are accustomed to thinking that low skilled workers enjoy little or no real wage growth over their lives. The common conception is one of work that involves little or no opportunity to engage in training and where learning by doing is very limited. In fact, recent research has suggested that low skilled individuals, even controlling for other observable characteristics, enjoy at least as high real wage growth as do skilled workers (see Gladden and Taber (2002)). In the light of this recent research it then becomes appropriate to ask whether welfare programmes affect this rate of growth.

The research to date that considers the impact of welfare receipt on wage growth has used data from the SSP (Canada). Connolly and Gottschalk (2001) have examined the wage dynamics of low-skilled workers using the SSP data. They estimate a search model, testing the hypothesis that the welfare programme itself affects the choice between jobs with different wage profiles.

In the Connolly and Gottschalk model individuals can choose between jobs that offer low starting wages but high growth, or jobs that offer high starting wages but low growth. At the margin, this decision can be affected by the size of the wage subsidy individuals receive from being on welfare. The decision rule is given by comparing the constant wage equivalents of jobs whose wage profiles differ over both slopes and intercepts.

There are two main predictions that arise out of the Connolly and Gottschalk model. For within-job wage growth the model predicts that a wage subsidy will not affect the choice between job-types. The intuition behind this is that the presence of a subsidy will not affect the threshold value that separates acceptable from unacceptable constant-wage jobs[13] This means that welfare recipients who do not change jobs

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[13] This result relies on the job being eligible for the wage-subsidy for the entire programme duration, which, for the SSP, is 36 months.

(labelled "job-stayers" below) ought not to have different wage growth to non-recipients, ceteris paribus.

The predictions of the model are different when one considers people who change jobs. For subsidy recipients who engage in on-the-job search the Connolly and Gottschalk model predicts lower wage growth than non-recipients. This is entirely due to the fact that the benefits of search (a higher wage) are reduced by the welfare taper[14], so search is less intensive and so job-to-job wage growth is lower.

The authors' theoretical predictions are not, however, entirely supported by the data. Using well defined treatment (SSP recipients) and control groups the tabulated data shows that the two groups have similar within-job wage growth over both an 18-month and 36-month horizon. They do find that between-job wage growth is higher for the treatment group, although the difference is not statistically significant. However, multivariate models of wage growth that control for the endogeneity of tenure show that the SSP group have significantly higher returns to both job tenure and job match, but lower returns to experience.

In contrast to the work of Connolly and Gottschalk (2001), the paper by Card *et al* (2001), which also looks at the wage growth of SSP participants, assumes that a feature of the programme itself is that it selects individuals who have relatively flatter wage profiles. Therefore their main hypothesis is that any differential wage growth for SSP participants is due to selection. Along with this selection issue, which is a feature of their model, Card *et al*. note that there are more traditional selection problems due to the fact that not all those who were eligible for the programme took it up. Despite their prior beliefs regarding the selection mechanism of the SSP, comparisons of the wage growth of the welfare-recipients with similar individuals (by labour market experience and initial wages) show that the two groups have similar wage growth. Their estimates of the average real wage growth of the SSP-group over a 21-month period are also broadly similar to other estimates of the real wage-growth of low-skilled workers across the US.

Neither Card *et al* or Connolly and Gottschalk consider the case where individuals can engage in human capital investment on-the-job. Yet, according to the

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[14] The authors call this a "reduction in the reservation wage" for on-the-job search, and the same situation could easily arise in the case of a wage subsidy of the WFTC/FC form.

evidence in Booth and Bryan (2003) from BHPS most work-related training is viewed by its recipients as general, the majority is informal, the longest formal training courses are for induction purposes, and the vast majority of formal training takes place either at the workplace or at the employer's training centre. Some of the early research on training suggests that employees pay for their own general training in the form of lower wages and share the costs of firm specific training.

More recent research, for example Acemoglou and Pischke (1998), has suggested that much training is industry specific rather than firm specific and that this would also feature some sharing of the costs. Thus, the training literature does suggest that workers contribute to the costs of any training in the form of lower wages than would otherwise be the case and that the decision to train, and hence the subsequent wage growth, would depend on a present value calculation. How this calculation would be affected by a wage subsidy depends on the nature of the subsidy. Suppose the subsidy were means-tested and one were close to the end of the taper so that eligibility is almost exhausted. Then we might expect the future returns to training to be largely unaffected by the subsidy, since it is about to expire. However, the subsidy would affect the net costs of training since the training would lower the wage and this would be partly offset by the subsidy. If the subsidy were not means tested at all and if it were linear (i.e. the subsidy rate was independent of income) then the subsidy would reduce the benefits and costs by the same amount and we would not expect an effect on training and hence on wage growth of recipients compared to non-recipients.

The WFTC/FC subsidy is complicated by the maximum – there is a range of income were individuals receive a maximum subsidy and so the marginal subsidy is zero, while for earnings above this point the marginal subsidy is positive. This is the case where the programme reduces the benefits and does not reduce the costs and so we would expect less training to occur and smaller wage growth. In contrast, for higher earning individuals being close to the end of the taper generates the opposite incentive effects – WFTC/FC then reduces costs but might have little effect on benefits and we would expect more training and higher wage growth for recipients.

Unlike EITC, FC/WFTC was means tested against household income and so many secondary workers whose partners are in work might have been expected to be closer to the point where eligibility would be about to expire than to the maximum

entitlement[15]. Thus, we would expect positive wage growth effects to be more likely for individuals with working partners present (two-earner couples) than for single parents.

A final complication was the implicit time limited nature of WFTC/FC. Eligibility depended on having a dependent child so that as children age the household came closer to the point where the adverse impact of the programme on future benefits of training fell to zero and the effect was therefore positive.

It is worth noting that the analysis in Connoly and Gottschalk is for a simple wage subsidy and the means tested structure of WFTC/FC makes its implications for job search different. In particular, similar considerations apply to job search as to training – job search is also an investment decision. If costs and benefits are similarly affected by the subsidy then there will be no impact. The costs of on-the-job search might be the forgone leisure while searching whose value, at the margin, is determined by the net wage and so is affected by the subsidy.

Following on from the discussion of the literature on wage-growth and welfare receipt, we address some of the testable hypotheses (drawn from Card *et al.* (2001) and Connolly and Gottschalk (2001) and from considerations of training) about the relative wage-growth of FC/WFTC recipients and non-recipients. The argument in Card *et* al would suggest lower within-job wage growth in the treated group while Connolly and Gottschalk suggest lower job-to-job growth. Our own arguments are less pessimistic and suggest positive effects on wage growth associated with those whose eligibility is either small and short-lived, because earnings are close to the point where entitlement falls to zero, or because eligibility is expected to be short-lived due to the youngest child approaching independence. This could be due to job search considerations or training arising from the nonlinear form of the means tested wage subsidy.

In the next section we present the data and tabulate some of the evidence to address each of the above ideas. The sections that follow then introduce more complicated multivariate analysis that allows us to formally test the hypotheses.

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[15] Administrative data shows that, in November 2002, the average award for two earner couples was approximately £59 compared to £86 for single earner households.

3.   Data

The analysis in this paper is based upon the five-quarter rolling panel of the United Kingdom Quarterly Labour Force Survey (LFS). The LFS is a continuous, household survey, which provides a range of data on labour market statistics, as well as related topics such as training, qualifications, income and disability[16] . The survey has a panel design where each sampled address is interviewed for five waves. Interviews take place at three month intervals with the fifth interview taking place a year after the first. During each quarter, interviews take place at about 59,000 addresses with about 138,000 respondents, representing a response rate of around 80%. In any one quarter there are five different cohorts, each from a different wave of the panel, that is, approximately 11,800 addresses in each quarter can be attributed to wave one, two, three, four or five.

Prior to Spring 1997, the LFS only asked respondents about their earnings in the first wave of the panel. After this point individuals were also asked their wages in the fifth wave. This allows us to observe wage *growth* over a twelve month period and using data from Spring 1997 to Winter 2002 we construct a data set that contains information on twenty cohorts of individuals. Dropping the self-employed and those with missing data for crucial variables we are left with a total of 51,074 men and 54,968 women – we drop the small number of single-father families which is too small for analysis, and find 40,546 are couples (married and cohabiting) of which 20,155 have dependent children, and 14,422 are single-women households (5,093 with dependent children, that is lone mothers). The numbers in the table are for a balanced panel, that is, we drop those individuals who we do not observe in both wave one and wave five. The details of how the sample is constructed are given in the appendix.

The fact that the LFS provides us with five-quarters of data on a panel of individuals means that we are able to measure job tenure, job changes (both quits and layoffs) as well as wage growth. This is important as it is well known in the literature that job tenure information in other datasets have been particularly unreliable (see Altonji and Williams (1998)). In LFS further questions on whether or not individuals

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[16] A full description of the data set, along with sampling and survey techniques can be found at http://www.statistics.gov.uk/themes/labour_market/surveys.

change jobs between waves allow us to remove those individuals who we believe are reporting inaccurate job tenure data[17].

The main features of the wage growth data are presented in Figure 1. Wage growth[18] can be defined with reference to hourly pay which is recorded in the data for a subset of individuals who report earnings, our as average hourly earnings derived from usual earnings and hours of work. Figure 1 graphs the wage data for these two alternative definitions for the three main groups of interest – lone mothers, married mothers, and married fathers[19]. While the average hourly wage formed by dividing earnings by hours of work has larger variance than the hourly pay they are clearly closely correlated[20]. Measurement error in hours of work may help explain why the ratio has higher variance than the direct hourly pay measure and Figure 2 shows the scatter of changes in the average earnings per hour worked against changes in the direct measure of average hourly pay and while the variance in the former is clearly higher there is nonetheless a strong correlation between the two measures. Overtime hours will also contribute to a difference in the two measures.

Hereafter, we use the data on directly recorded hourly pay – although our substantive findings are unaffected by this choice. There is no strong reason for preferring one measure over the other on economic grounds. They clearly measure different things – hourly pay may be a better indicator or household welfare (since its changes are independent of changes in recorded hours of work), while average earnings per hour change because both hours and earnings change.

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[17] In the few cases where it is obvious that an individual has misreported their job tenure, we drop the observations.

[18] The models discussed in the literature review make predictions about whether individuals on welfare are more or less likely to take part in activities that will lead to higher wages. Job training is one such activity. Every wave-quarter of the survey contains detailed questions on whether a worker has undertaken any training in the previous 13-weeks. Not only do we know whether a person did any training during the 12-months for which we observe their wage growth, but we also know what type of training it was, whether and how it was related to the job, and who paid for the training - Whether or not the employer paid for the training is perhaps a good indicator of the firm-specificity of the training/human capital investment. We are investigating the direct effects on training in a companion paper.

[19] We have dropped the lone parents who are men because they are such a small sample.

[20] Simple regressions, for samples where they are both recorded, of one against the other have a slope of 0.83 (s.e. 0.002) and an intercept of 0.36 (s.e. 0.005) with an R-squared of 0.76 for the fathers, and a slope of 0.82 (s.e. 0.002) and an intercept of 0.31 (s.e. 0.003) with an R-squared of 0.77 for the mothers. For more detailed comparsions see Skinner *et al* (2002).

Figure 1   *Average Earnings per Hour Worked against Reported Hourly Pay:*
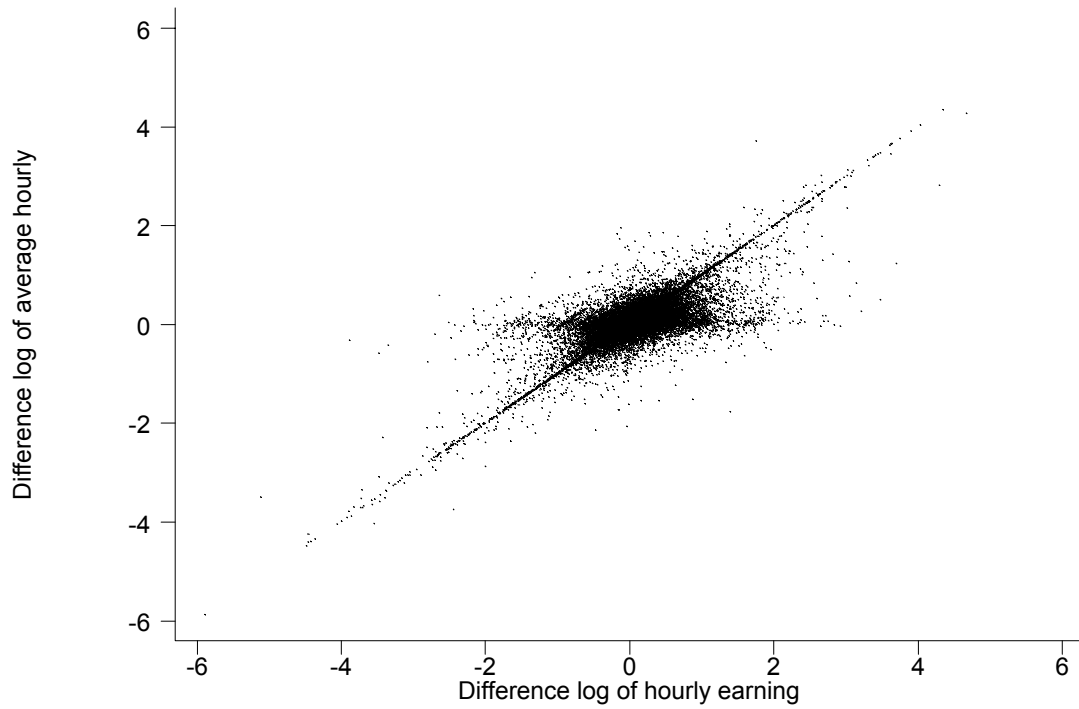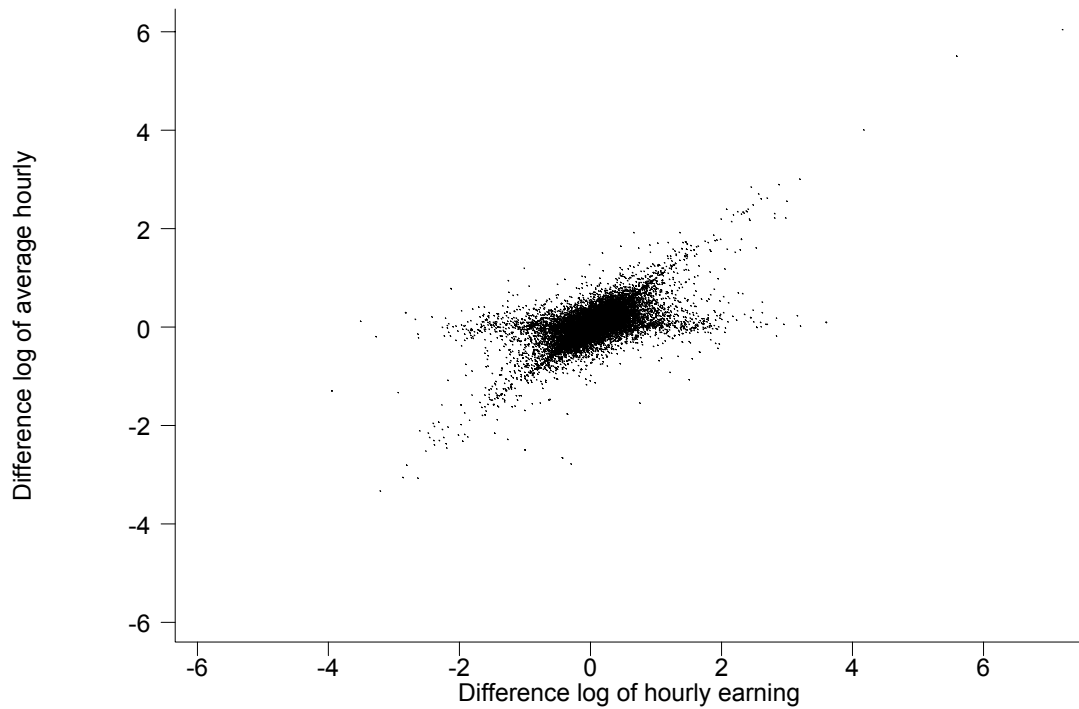   *Men in LFS 1997 - 2002*

Figure 2   *Average Annual Change in Earnings per Hour Worked against*
              Annual Change in Reported Hourly Pay: Women in LFS 1997 -
              2002

4. Results for the LFS

Table 1 shows the breakdown of the data by WFTC/FC status: 20% of households with children were lone mother households in the data; 9% of married couples were in receipt of WFTC/FC and 44% of lone mothers. Lone mothers were much more stable recipients with more than half of recipients receiving it in both waves 1 and 5, while less than one-third of married recipients were receiving in both waves 1 and 5.

Table 1   FC/WFTC receipt for married couples and lone mothers

|	Married Couples		Lone Mothers	
	Frequency	%	Frequency	%
Always on	718	2.74	1,647	26.13
Never on	23,939	91.41	3,486	55.32
Off-on	995	3.80	600	9.52
On-off	536	2.05	569	9.03
Total	26,188		6,302	

Note: Omits 76 households who record receipt but no dependent children present. The *Off/on* and *On/off* are for single transitions only – we exclude households that record more than one transition between WFTC/FC recipiency and not. This might arise because receipt is incorrectly recorded in one or more quarters so that a 3 quarter spell might be recorded as two short spells with two transitions and a spell on non-receipt in between. We omit such multiple transition cases because we lack confidence in the reliability of their WFTC/FC data.

The WFTC/FC take-up rate is shown in Figure 3. This is computed as the number receiving and entitled divided by the number entitled. LFS considerably under-records takeup relative to FRS partly because it has no assets and so overstates the numbers entitled. However, comparisons with FRS suggested that this was not a large source of error and the main reason why these figures depart from official statistics is because we cannot include pipeline cases (who have claimed but not yet received) and we drop non-entitled recipients. The figure marks the advent of WFTC and there was a large increase in take-up in LFS shortly after the reform.

4.1 Wage Growth by FC/WFTC History

Table 2 shows the mean % changes in the real wage between wave 1 and wave 5 broken down by WFTC/FC status. The hourly wage is the directly observed hourly pay variable (similar findings apply for our constructed average hourly earnings)

Figure 3   WFTC/FC Takeup
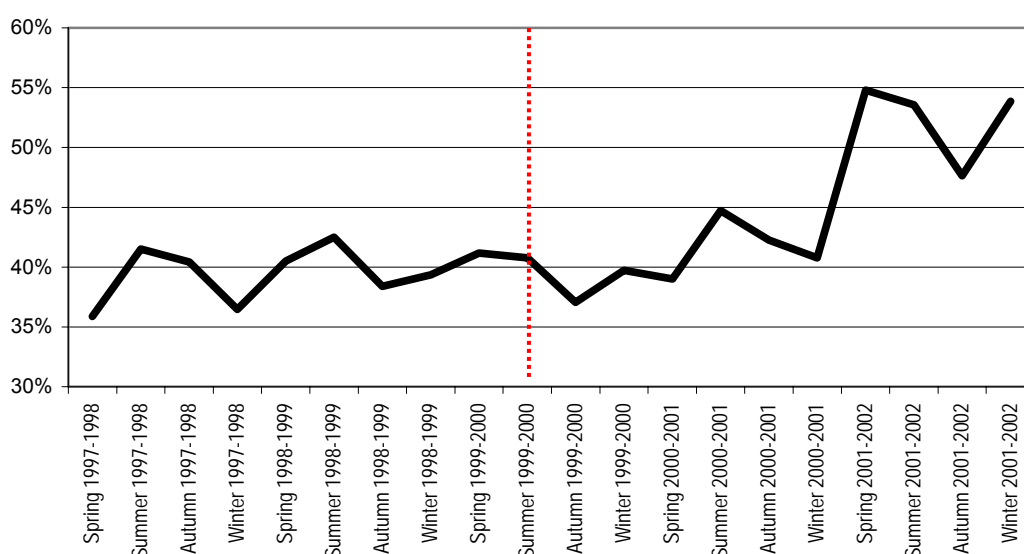
The FC/WFTC history variable describes each individual's FC/WFTC status for all waves. Using the rules for eligibility for FC/WFTC, based on incomes and the number of dependent children in a household, we are able to calculate the maximum amount for which a household is eligible[21]. The introduction of WFTC was phased in from October 1999, so between October 1999 and Spring 2000 it is not possible to identify whether these individuals in the LFS are in receipt of FC or WFTC[22]. Here we assume all such individuals post cohort 11 are on FC in wave 1 and we have checked that he results in this section are not sensitive to whether we calculate the maximum entitlement using FC rules or WFTC rules. There are four possible states for the FC/WFTC history variable (excluding the non-eligible recipients and those whose status changes more than once between waves 1 and 5): *Always on* - people who are in households that always receive the credit which is further divided into those receiving close to the maximum or more and those receiving less than 95% of the maximum; *Never-on* are people who are in families that never receive the credit either because they do not take-up their eligibility or because they have no eligibility; *Off/on* are people who are in families that make a single off/on transition between waves 1

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[21] Unfortunately the LFS does not include questions regarding the amount of savings or childcare expenditure in a household. We assume that savings (and childcare) are equal to zero when calculating the maximum amount for which a household is eligible.

[22] Up until the end of 1999, the amount of FC/WFTC a household was receiving was included in the Labour Force Survey data but thereafter only whether the household is receiving WFTC/FC is recorded.

and 5; and *on/off* are people who make a single on/off transition between waves 1 and 5.

Table 2 shows that those that move from being on to off experience high wage growth in all groups at all times. This is the group that ceases to be eligible because of their high wage growth. Part of their higher wage growth might arise because, being close to the level of earnings at which entitlement ceases, they have the sharpest incentives to exploit the implicit on-the-job training subsidy because their entitlement is close to exhausted so few of the wage gains will be taxed at the WFTC/FC taper. In contrast the group that moved from off to on exhibit quite low wage growth – part of the reason why they fall into eligibility for FC/WFTC.

The non-entitled groups are, of course, higher wage workers and they typically exhibit modest levels of wage growth, while the non-takeup groups are lower wage workers and these typically exhibit higher wage growth perhaps because they are younger, have lower tenure, lower education, etc. Alternatively, this latter group may fail to takeup because they expect to be entitled for a short period either because of their anticipated high wage growth or because their wage levels are not amongst the lowest of recipients and they are close to the point where their entitlement to WFTC/FC would, in any case, be exhausted.

Finally the breakdown between those on (95+% of) the maximum and those receiving but less than (95% of) the maximum is our crude attempt to capture the different incentives faced by: those not benefiting from a taper on the low wages that apply to jobs with significant training and facing the prospect of having the taper applied to their wage gains; compared to those benefiting from a taper being applied to their low wages while training looking forward to the prospect of the wage gains being free from the WFTC/FC taper. The table shows some degree of consistency with this even though the group on the maximum FC/WFTC are the lowest wage group and we would expect them to be low tenure, low experience and hence high wage growth and, in any case, the tendency for mean reversion would be strongest for them. In fact, we find there are higher levels of wage growth for those on less than the maximum compared to those on the maximum. Moreover, the wage growth for those on the maximum was typically less than for those who are in the non-takeup group – who we might expect to be relatively low wage workers themselves.

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It is also instructive to compare across periods. For those receiving the maximum there is no subsidy either under FC or WFTC and so there are no differences to the net costs of training across periods. But there was an increase in the taper so this will have raised the "tax" on wage growth for this group. Hence we would expect some decrease in wage growth for people on the maximum – and we do observe a large drop for married women. For those who received less than the maximum there was a reduction in the taper (from 70% to 55%) and our theory would suggest this would represent a reduction in training subsidy. Hence we ought to see lower wage growth under WFTC than under FC. In fact, we observe a decrease for married men, no change for married women, and a rise for lone mothers. It is not clear why this should be so, but part of the reason might be the lower wage growth for low wage lone mothers overall – those lone mothers who fail to take-up a positive entitlement appear to experience lower wage growth in the WFTC period (6% instead of 9%).

Table 2   % Wage (hourly pay) growth by FC and WFTC Receipt Status

	Married Men		Married Women		Lone Mothers	
FC Status	Mean	Std dev	Mean	Std dev	Mean	Std dev
Always on						
Receipt<0.95 of max	18.20	(7.80)	10.03	(3.28)	9.33	(1.81)
Receipt>0.95 of max	5.53	(1.33)	14.33	(4.97)	0.88	(2.36)
Never on						
Non-takeup	13.93	(1.23)	7.66	(0.60)	10.14	(1.84)
Not entitled	3.81	(0.47)	6.88	(0.56)	9.19	(1.43)
Off/on	3.02	(3.16)	-2.00	(4.34)	1.56	(5.16)
On/off	11.43	(4.03)	11.85	(3.53)	8.81	(4.26)
WFTC Status						
Always on						
Receipt<0.95 of max	16.97	(4.54)	10.78	(3.51)	22.51	(2.06)
Receipt>0.95 of max	5.36	(1.27)	5.59	(2.63)	-0.36	(1.61)
Never on						
Non-takeup	11.48	(0.71)	9.07	(1.76)	6.13	(0.51)
Not entitled	3.74	(0.38)	6.13	(0.50)	6.17	(1.60)
Off/on	4.17	(1.20)	6.67	(1.41)	8.06	(1.86)
On/off	10.56	(1.87)	8.92	(2.61)	12.34	(2.60)

Note: Standard deviations in parentheses.

4.2   Wage Growth by Job Tenure

Individuals on FC/WFTC have significantly lower levels of average job tenure than almost any other group. The average job tenure for women who were always on FC/WFTC is just 44 months, whereas for women who were never on FC/WFTC it is 96 months. The same figures for men are 47 months and 123 months respectively. The only group who have lower job tenure on average are those who make more than one transition on or off FC/WFTC over the five quarters. Because job tenure may well be important for wage growth Figure 4 breaks down the wage growth by both WFTC/FC receipt and job tenure.

Figure 4   Job tenure and wage growth by WFTC/FC: All women only
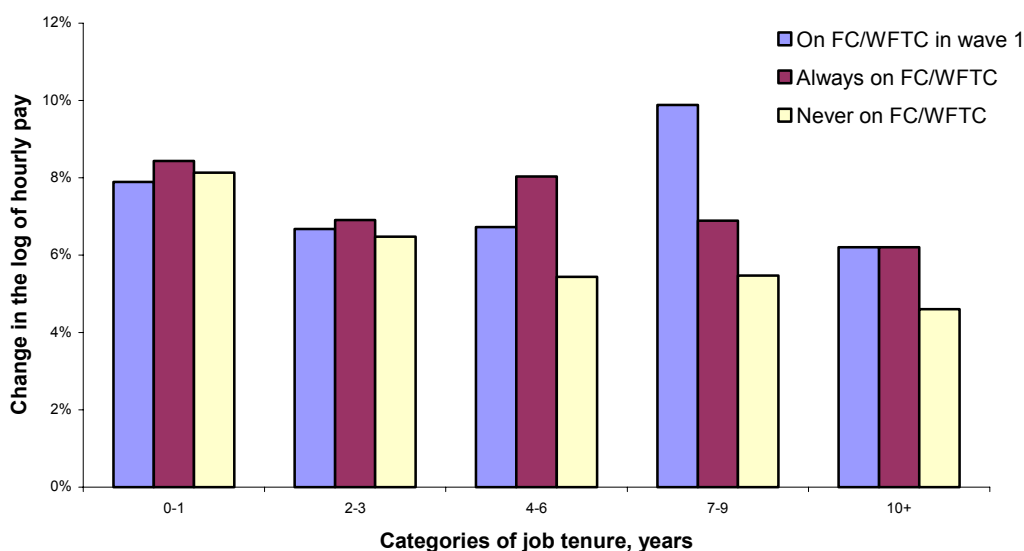
Notes: The information on wage growth for FC/WFTC recipients with tenure greater than 10 years is limited, as we observe very few individuals with job tenure in this range. We therefore group all of these people into a single category 10+ years. The precise figures are as follows: we find that 90% (93%) of men (women) always on FC/WFTC have job tenure ≤ 10 years; 72% (78%) of men (women) always on FC/WFTC have job tenure ≤ 6 byearss; for men (women) never on FC/WFTC we find that 61% (71%) of them have job tenure ≤ 10 years, and 43% (50%) ≤ 6 years. The samples contain 3041 individuals on WFTC/FC in wave 1, 2365 always on, and 27,435 never on.

Figure 4 plots the mean wage growth by FC/WFTC and durations of job tenure in wave 1. As is usual, high wage growth occurs early in spells of tenure. This figure is drawn for those individuals who do not change jobs between waves 1 and 5. We also restrict the comparisons of wage growth to those individuals who were always-on FC/WFTC and those who were never-on FC/WFTC. The majority of (continuous) FC/WFTC recipients can be found at the bottom end of the job tenure

distribution. For both men and women in families who were always on FC/WFTC, we find almost three-quarters of them report job tenure in wave 1 of less than or equal to 6 years.

Comparing wage growth by job tenure we find that women who were on FC/WFTC reported wage growth which was, on average higher than women with comparable initial job tenure. This is the case for almost all the job tenure categories in Figure 4, and the differences persist when we consider lone mothers only.

4.3 Wage growth by qualifications and education

The LFS contains a considerable amount of information on respondents' qualifications and skills. Wage growth may be affected by these qualifications so in Figure 5 we break the sample by both highest qualification (grouped in NVQ level) and WFTC/FC status and as before we again restrict the comparisons to those individuals who are always on FC/WFTC and those who are never on FC/WFTC.

Figure 5   Breakdown of Highest Qualification by WFTC status
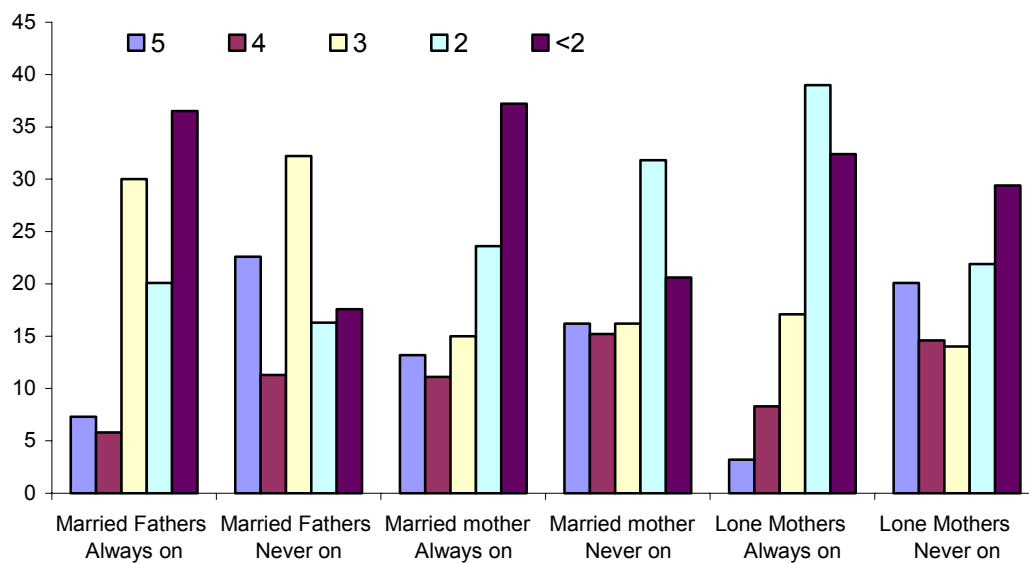
The data clearly shows that WFTC/FC recipients have much lower qualifications than those parents who are never in receipt of WFTC/FC.

Table 3 shows the change in the log real wage between waves 1 and 5 by highest qualification observed in wave 1[23]. W compare the wage gains and find that

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[23] We restrict the sample of FC/WFTC non-recipients to individuals with job tenure less than or equal to 96 months because the sample size of longer tenure is rather small.

typically WFTC/FC recipients had greater wage growth, confirming the previous comparisons we made by job tenure. This was especially true amongst the low education groups, where most recipients are to be found.

Table 3   *Real wage growth rates for FC/WFTC recipients and non-recipients by highest qualification (at t-1)*

Qualification	Married mothers		Married fathers		Lone Mothers	
	Always on FC/WFTC	Never on FC/WFTC	Always on FC/WFTC	Never on FC/WFTC	Always on FC/WFTC	Never on FC/WFTC
NVQ5	12.57	6.10	7.34	8.02	8.46	9.43
	(0.35)	(0.44)	(0.37)	(0.38)	(0.32)	(0.34
NVQ4	-0.10	6.33	7.40	7.55	6.71	7.77
	(0.51)	(0.42)	(0.37)	(0.38)	(0.35)	(0.37)
NVQ3	5.70	6.12	7.40	6.94	5.17	7.33
	(0.44)	(0.42	(0.37)	(0.38)	(0.40)	(0.35
NVQ2	8.71	5.88	6.52	6.89	7.02	7.09
	(0.41)	(0.41)	(0.33)	(0.37)	(0.36)	(0.33)
NVQ<2	6.71	4.02	7.88	4.23	10.00	5.43
	(0.39)	(0.39)	(0.37)	(0.41)	(0.40)	(0.32)

Notes: Standard deviations in parentheses. Observations are for a balanced panel of employees in both waves one and five of the LFS. Approximately 84% of the FC/WFTC recipients are in the three groups above. Standard deviations are in parentheses.

4.4   Job mobility and wage growth

The LFS allows us to identify two groups of workers: those who continue to work with the same employer over the five waves (12-month period): "job-stayers"; and those who change employers: "job-movers"[24]. Several papers have noted the importance of mobility in wage growth. The literature that relates migration decisions to investments in human capital provides some support for the hypothesis that labour mobility can also be seen as an investment in human capital (see Widerstedt (1998) and references therein). Gottschalk (2001) also finds that the relative wage gains for job-movers are considerably larger than those for job-stayers. The Connolly and Gottschalk model predicts that individuals on the SSP programme would be less mobile (because they have fewer incentives to search for a more highly paid job). We can test a couple of basic hypotheses using the data from the LFS. Firstly: are individuals who are always on FC/WFTC more or less likely to leave their jobs? And secondly, are their wage changes comparable with FC/WFTC non-recipients who also leave their jobs? Using the LFS we can determine whether an individual moved jobs using one of two constructed variables. The first variable is constructed from

[24] The second group could be further divided into quits and layoffs but we have few observations of the latter.

respondents' answers to a question in each wave that asks them whether or not they have left a paid job in the previous thirteen weeks. Unfortunately the wording of the question implies that they may have left a paid job that is not their main job. However, few have second jobs and, based on comparisons with our second measure of job change below, we would argue that the margin of error due to this problem is negligible. Using the answers to this question and several follow-up questions we can also determine whether a respondent has changed jobs more than once, and also whether their mobility is down to quits or layoffs.

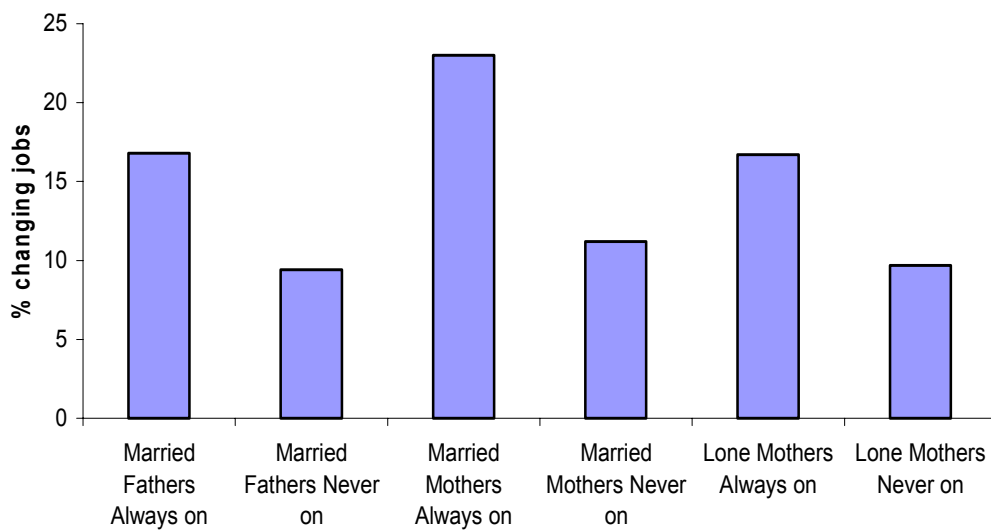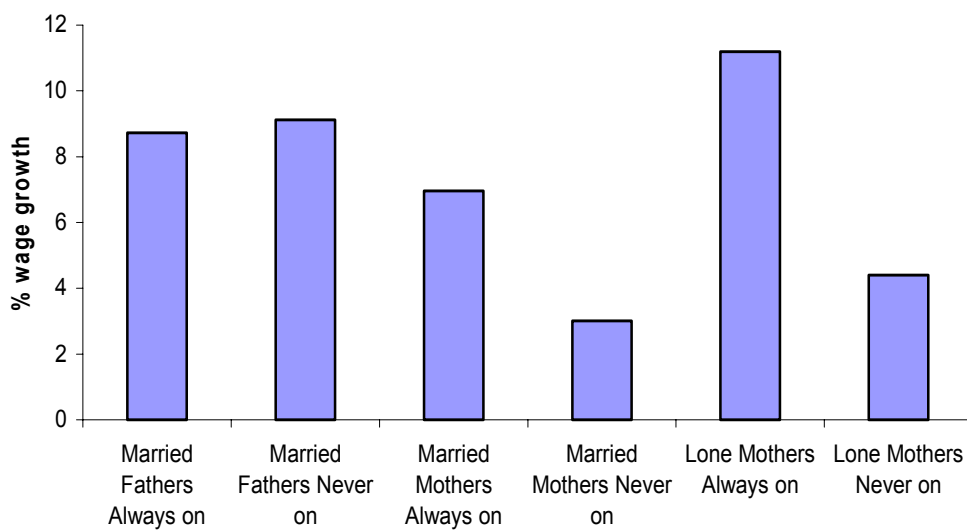*Figure 6   Job changes by WFTC/FC status*

Figure 7   Wage Growth by WFTC/FC status

The second job-change indicator variable is constructed from the job tenure data. We know the year and month each respondent is surveyed, and we also know the

year and month they started their current job. A comparison of the two dates tells us whether or not a person has changed jobs. As with the first measure, there is some margin for error here. Firstly, using this measure of job change it is difficult to determine whether somebody changed jobs more than once. And secondly, as noted in Altonji and Williams (1998) there is a tendency for respondents to report their job tenure with error, particularly after changing jobs. This particular problem, combined with the well known recollection bias problem leads to possible measurement error issues. However, comparisons of this measure of job change with our first measure allows us to eliminate much of the measurement error[25] .

The proportion of individuals who are job changers are shown as column in Figure 6 and Figure 7 shows the differences in wage growth across groups. For each of our groups WFTC/FC *always on* have substantially higher chances of moving jobs between wave 1 and 5 compared to *Never on*[26]. While these figures are suggestive, unfortunately the cell sizes are too small to do a reliable breakdown by whether individuals are receiving the maximum or something less. This would be useful to see if WFTC/FC were acting as an on-the-job search subsidy – since effective on-the-job search might require some reduction in working hours and consequent reduction in income which would be smaller for those in the taper than for those on the maximum.

However, wage growth in Figure 7 whilst almost the same for married fathers, is close to double amongst mothers Al*ways on* relative to *Never on.* It is possible to break down the wage growth by whether individuals are job changers or not (but not further by whether recipients are on the maximum) and this is shown in Figure 8. Figure 8 shows that wage growth is larger amongst those who change job. Married fathers on WFTC/FC are just as likely to change job as those never on and the wage change appears to also be essentially independent of whether they are *Always* or *never on.* However mothers who are *always on* are more than twice as likely to move as those *never on* and Figure 8 shows that they also gain a larger wage advantage than

[25] For example, using measure (1) we might find a respondent has changed jobs between wave 1 and wave 5. However, using measure (2) we might find this not to be the case. If we looks at each of these people on a case-by-case basis we find that many of them report job tenure in wave 5 of 12, 13 or 14 months, indicative of some recall error about when they started their current job. Given that measure (1) is constructed using answers to questions that require them to recall only the previous 13 weeks, we would argue that many of these individuals can be classified as having changed jobs (both in measure (1) and measure (2)). Further details on how the data is cleaned in this way is available from the authors on request.

[26] All probabilities are for the sample of individuals with job tenure less than or equal to 96 months.

those that do not change. Thus, at least part of the additional real wage growth experienced by FC/WFTC recipients compared to non-recipients is due to them quitting more frequently to take higher paid jobs.

*Figure 8*   *Wage growth % by job change and WFTC/FC status*
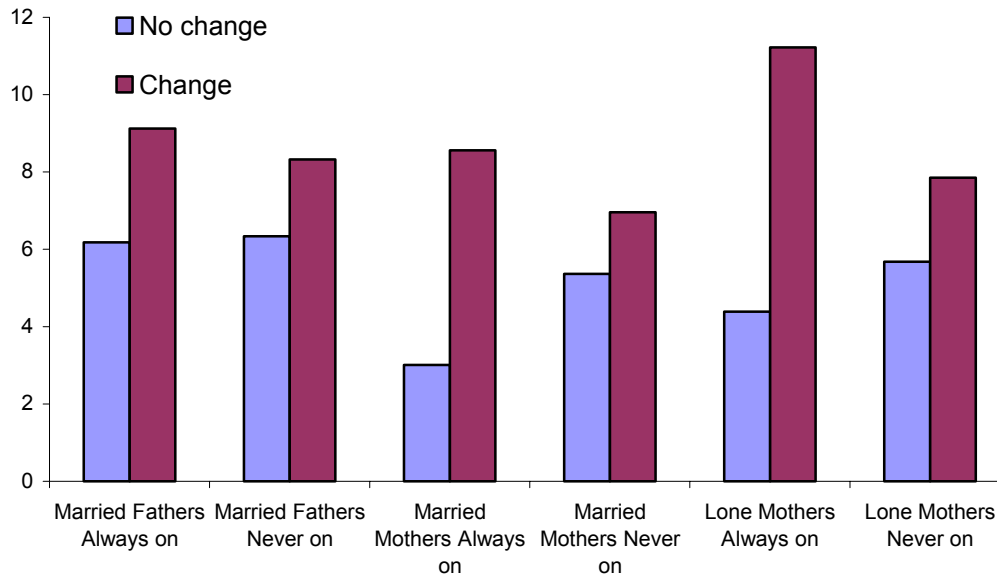
4.5   Wage levels and wage growth

The importance of the initial wage in career wage growth has been investigated by Gladden and Tabor (2002) who show that the starting wage is an important determinant of overall wage growth[27].

Figure 9 shows the average change in the log hourly wage for married fathers, married mothers and lone mothers grouped together (to provide reasonable cell sizes), by quintiles of the starting wage. There is no difference by WFTC/FC status until a long way up the wage distribution, where there are few WFTC/FC cases and so the differences are very imprecise. In other words, we can reconcile this figure with earlier figures by noting that the *always on* group are heavily concentrated at the bottom half of the distribution while the *never on* group is heavily concentrated towards the top. Effectively, comparing the vast majority of WFTC/FC recipients with similar non-recipients (i.e. comparing only in the bottom quintile) there is larger wage growth (of about 0.03 (i.e. 3%) for recipients.

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[27] Gladden and Tabor consider the starting wage at the time of entering the labour market. They wish to use this as a proxy for the heterogeneous characteristics that potentially bias the slope coefficients in a log wage equation. That is, it is the permanent (unobserved) component of the wage equation.
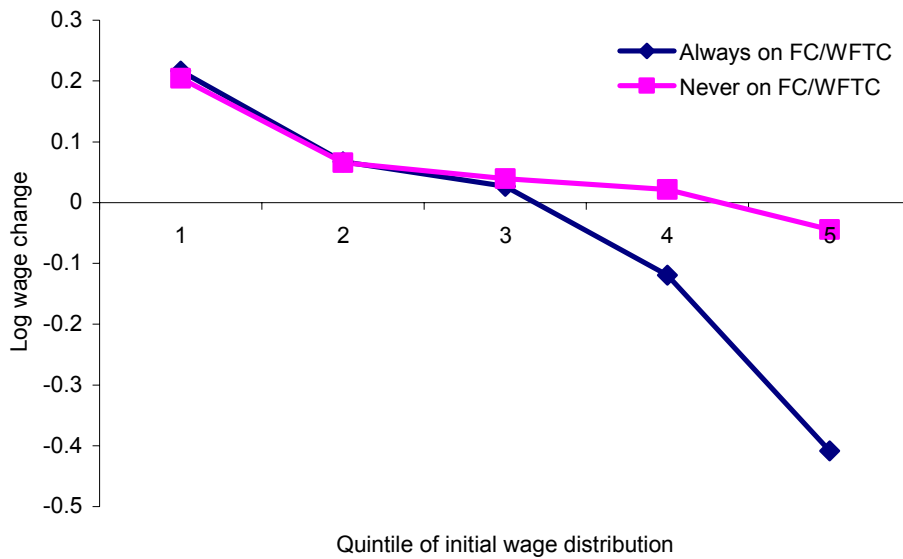
5. Wage Growth and FC vs WFTC

Much of the analysis above has supported the idea that wage growth was affected by WFTC/FC status in ways which support the idea that wage subsidies affect wage growth via incentives such as on-the-job acquisition of human capital such as training. However a major concern with the results above is that, while we control for some of the observable differences between individuals, we fail to control for unobservable differences between individuals.

One approach to resolving this difficulty is to exploit the WFTC reform. WFTC extended the taper higher up the income distribution so that individuals who were originally too well paid to be entitled to FC now became entitled to WFTC (the change in the maximum was modest in comparison). Thus we can identify the pre-reform individuals who are not entitled to FC but would be entitled to WFTC had it been introduced. In principle this group of newly-entitled individuals is the same, on average, to those who were in this part of the wage distribution prior to the WFTC post-reform and hence were not subject to the effects of the taper. That is the WFTC reform presents us with a natural experiment that allows us to compute a difference-in-differences estimate of the effects of the taper on wage growth.

Table 4 presents the raw data for these comparisons. All of the first six groups in the table are entitled both pre and post reform and is split into recipients and non-

recipients and then further divided into level of receipt. The seventh group are those who are floated onto tax credits by the reform. And there is a final group, not shown, which are those people who are not entitled and not receiving either pre or post reform. In each case, we have grouped the data across types of individual to try to get more precise estimates. FC and WFTC refer to levels of entitlement while R refers to receipt. Note that someone with FC>0 will necessarily have WFTC>0 because WFTC was more generous for all individuals.

Consider the non-takeup groups first. The FC>0, R=0 group wage growth was 11% and post WFTC this becomes 10.8% which suggests that the macroeconomic environment for low wage workers was not changing much over this period. This is reinforced by inspecting the 0<FC<0.9*max, R=0 subgroup, which is a not quite so low wage part of the non-takeup group where wage growth rises only from 7.5% to 8.1%, while the FC>0.9*max, R=0 subgroup, which is a very low wage group, has wage growth that fell from 17.9% to 15.8%.

Comparing those who are on the maximum and who takeup (FC>0.9*max, R>0) we see that wage growth *rises* from 10.5% to 12.3% (a difference of 1.8% which is not statistically significant) despite the small increase in the disincentives for wage growth arising from the rise in the taper. One reason for this might be that the maximum plateau got longer under WFTC so that, for given wage level and wage growth, recipients of the maximum could expect to remain on the maximum for longer – delaying the time when the wage gains would be subject to the taper.

Table 4   Wage growth under FC and WFTC

	FC period		WFTC period	
	Mean	Std Dev.	Mean	Std Dev.
WFTC/FC takeup group				
FC>0, R>0	0.070	*0.012*	0.094	*0.010*
FC>0.9*max, R>0	0.105	*0.017*	0.123	*0.014*
0<FC<0.9*max, R>0	0.038	*0.017*	0.025	*0.014*
WFTC/FC non-takeup group				
FC>0, R=0	0.110	*0.010*	0.108	*0.008*
FC>0.9*max, R=0	0.179	*0.020*	0.158	*0.014*
0<FC<0.9*max, R=0	0.075	*0.011*	0.081	*0.009*
Newly entitled group				
FC=0, WFTC>0	0.046	*0.017*	0.073	*0.013*

The receiving group not on the maximum (denoted 0.9*max>FC>0, R>0) is the group which tells us about the effect of the *fall* in the taper from 70% to 55% and we see that wage growth has *fallen* from 3.8% to 2.5%. Again we attribute this to the fact that the tapered region has got longer so, for given wage and wage growth, WFTC recipients can expect to remain on the taper for longer than FC recipients. This delays the time when the wage gains become free of the taper. If this 1.3% fall in wage growth for a 15% fall in taper were linearly extrapolated to a *rise* in the taper from 0 to 55% (which is what happens to the newly entitled recipients under the reform) we would expect this group to experience a 4.7% *rise* in wage growth.

The most informative group, however, is the FC=0, WFTC>0 group whose wages made them newly eligible to WFTC post reform but who were ineligible for FC pre-reform. Here wage growth rises from 4.6% to 7.3% perhaps reflecting the changes in incentives that have occurred (none of the newly entitled group would be entitled to the maximum). This wage growth change of just 2.7%, although still statistically significant, is somewhat smaller than the extrapolation from the (slightly poorer) group who are on the taper both pre and post reform. This might reflect the fact that the newly entitled are likely to be closer to the point at which they cease to be entitled to credit and so face a shorter period of time over which they have to pay the taper on their wage gains.

While Table 4 presents the results of a natural experiment it might still be desirable to examine the effects of the reform using multivariate methods. Although this natural experiment is unusual, since it allows us to compare individuals in the same parts of the wage distribution both pre and post reform, there may still have been changes that occurred over time that changed the composition of the FC>0, R>0 and FC=0, WFTC>0 groups. For example, the introduction of the National Minimum Wage, just 6 months ahead of the WFTC reform, may have inflated wage growth prior to the reform. Inspection of the data did not reveal any changes at that time or just before. Another change was the treatment of childcare costs which became more generous under WFTC. Inspection of the data for mothers with pre-school aged children in the household, where formal childcare expenses are more of an issue does not reveal large differences relative to the group with older children. Moreover, inspection of the observable characteristics (age, job tenure, education, etc.) of these two groups before and after the reform does not show any significant changes in

characteristics. Thus, it seems unlikely that multivariate methods would add anything to our quasi-experimental evidence and such methods have the further disadvantage of requiring further assumptions to be made.

6. Conclusion

A criticism often levelled at in-work support programmes is those that respond to the incentives to join the labour market may end up in "dead end jobs" that have few prospects for progression up the wage/occupation distribution. The argument behind this proposition is never spelled out explicitly but seems to rely on a lack of incentives, for both worker and firm, to make investments in factors that promote wage progression – such as on-the-job search and training in general skills.

The main aim of this paper was to test whether this was indeed the case exploiting the natural experiment offered by the reform of FC. We found that the reform left those in receipt of the maximum FC with unchanged incentives for wage progression and no significant change in their wage growth. While those who became eligible for WFTC and who had not previously been eligible for FC face greater incentives for wage progression and we do find a change of 2.7% - which is large in the light of the overall mean real wage growth of just over 3%.

These results suggest that in-work welfare programmes can be designed to offer wider incentives beyond simply promoting the incentive to work. In particular, if such programmes can be designed to promote wage growth then there will be further, long run, effects on work incentives. Indeed, we would expect a policy that promoted wage growth would be good for long run work incentives even if there were no direct effect of the reform on work incentives. This is because work is the utilisation rate of human capital – so policies that promote human capital formation will, in an intertemporal model, also promote future work incentives.

Further research is prompted by the analysis here. A structural model that captures the way in which the net returns to wage progression investments is affected by the level of WFTC/FC receipt and the level of the taper would be amenable to multivariate modelling and would provide lessons for how such programmes might be better designed to capitalise on this effect. The level of receipt and the size of the taper play a role in determining how long individuals expect to remain on the programme and so capture the idea that receipt is, to an extent, time limited. A further

time limit is created through the dependence on the presence of children in the household - as children cease to be dependent then entitlement ends. Since time limiting sharpens incentives it would be useful to factor this effect into the analysis. It seems likely that this would also have to be part of an econometric analysis since sample sizes of a breakdown by age of youngest child would yield very small cell sizes. Moreover, an analysis such as this should be combined with labour supply modelling to provide a vehicle for simulating the long run impact of in-work welfare. Finally, the analysis should be applied to consider the impact of the introduction of Working Tax Credit to individuals who are not parents.

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Appendix

Excluding children, we have a possible total of 292,580 individual observations. The male and female samples are for individuals who were employees in both waves 1 and 5, and who also provided earnings and hours information in both waves. The loss of over two-thirds of the sample as we remove certain individuals may lead to some selection problems. However, as we moved from one level of the data to the other, we checked the means and distributional informational on the sample[28].

Figure 1   Tree-diagram of working sample from the Labour Force Survey

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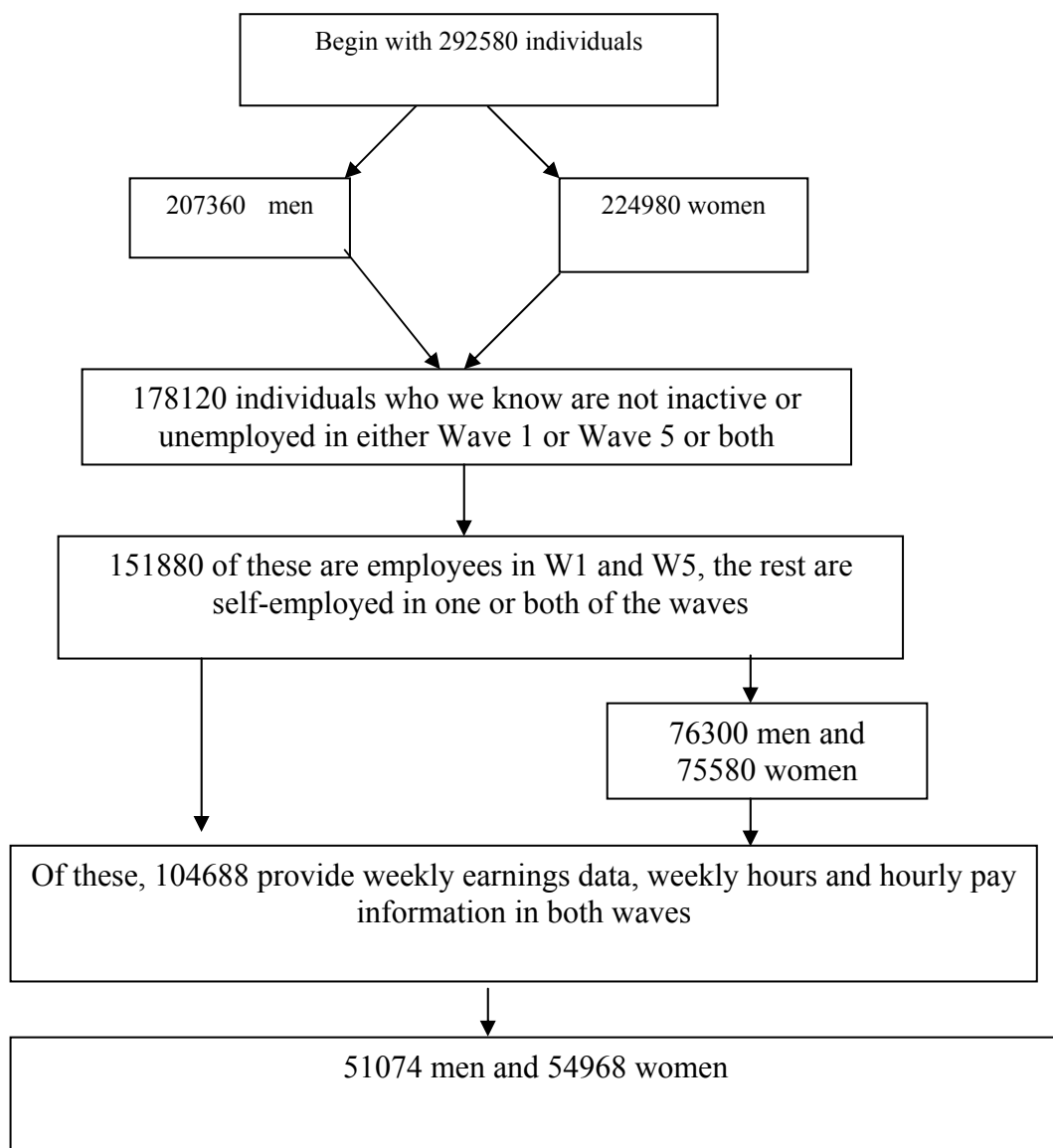
[28] For example, we compared the age distributions, job tenure data, mean wages, occupation and industry distributions, welfare receipt, region, income, etc. The information is available on request.