



Europe Economics

The Economic Impact of the Work Programme

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About ERSA



This report has been commissioned by the Employment Related Services Association (ERSA).

The Chief Executive of ERSA, Kirsty McHugh, said:

Providers of employment support know they are making a real difference to people's lives, and now we have the evidence to show that the Work Programme is delivering for the economy. It is giving the long term unemployed a chance in the workplace; saving taxpayer's money; and supporting growing businesses looking for new employees.

As we head towards the General Election in 2015, I hope all parties will look at this important research and get behind the employment support sector's efforts to give the long term unemployed a chance in the workforce.

The Employment Related Services Association (ERSA) is the sector body for organisations delivering or with an interest in employment related services – sometimes called welfare to work. Established in 2005, they exist to help their members achieve a shared goal: to help people gain sustainable employment.

ERSA represents organisations that deliver, or have an interest in the delivery of, employment related services including the Work Programme. The scope of their reach includes skills provision, self-employment, offender related services, welfare reform and disability-related issues, as well as the design and delivery of employment programmes.

Their membership spans the private, voluntary and public sectors and it is this diversity that gives ERSA the authority to speak on behalf of the entire employment related services sector. ERSA's members range from multi-nationals through to small specialist charities operating in their local communities.

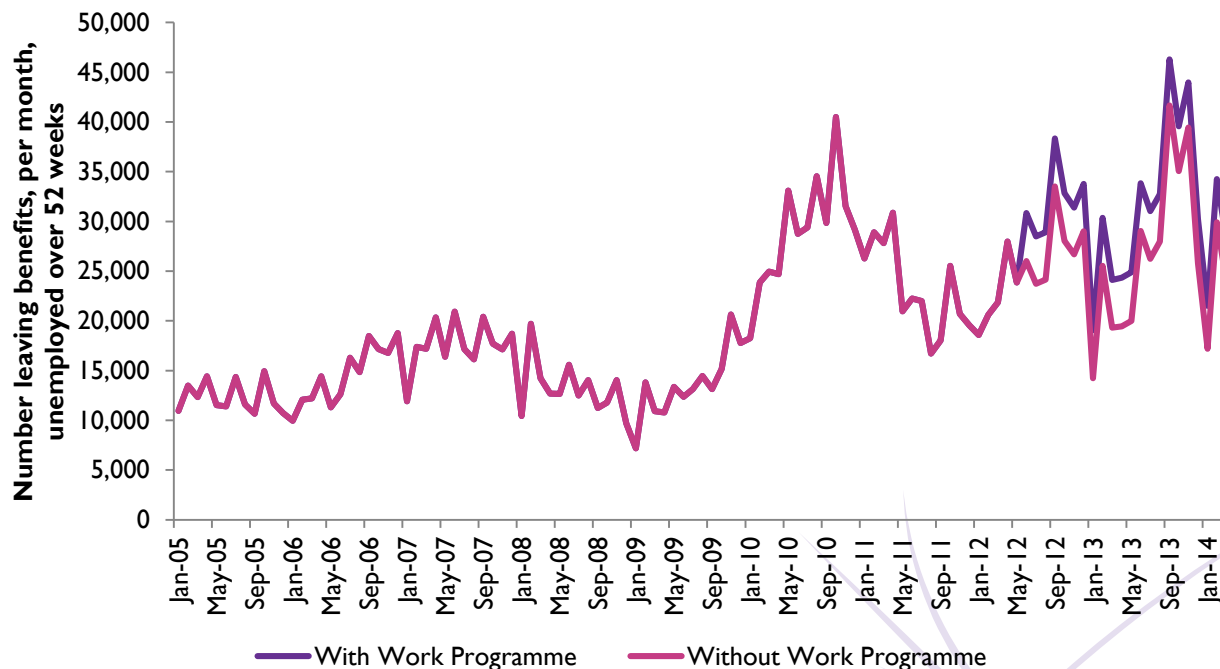
Executive Summary

The Work Programme is a payment by results scheme introduced by the Government in 2011 to support jobseekers who have been out of work for a prolonged period, normally at least a year, to find and sustain employment. Since the outset, the scheme has attracted controversy, not least as judgements of its overall value were difficult to achieve in the early days of the scheme.

To coincide with the third anniversary of the Work Programme's introduction, the Employment Related Services Association (ERSA), the representative body for the employment support sector, commissioned Europe Economics to model the economic impact of the Work Programme. Europe Economics constructed and calibrated a time series model of the rate at which long-term claimants leave benefits. We then included the Work Programme in order to estimate its effects. The Work Programme was found to have a positive impact on the number of long-term claimants leaving benefits.

In order to understand the wider economic impacts of the programme we then constructed three representative profiles of jobseekers: a single, over 25, jobseeker living in Glasgow; a single, under 25, jobseeker living in London; and a family living in Birmingham – and estimated the economic benefits of the labour market impact found for the workers themselves, for the exchequer and for business.

Our results suggest that of the 1.5 million net attachments there have been under the Work Programme, around 100,000 more people, unemployed for 52 weeks or more, found work between June 2011 and April 2014 than would have without the Work Programme.



In our central case, the present value (in 2014) of the wider benefits of those additional jobs starts, over the remaining working life of the claimants concerned, is around £18bn:

- Workers benefit by an average of £140m a year between 2011 and 2059, or £7bn in total.
- Government benefits by an average of £140m a year between 2011 and 2059, or £7bn in total.
- Capital benefits by an average of £80m a year between 2011 and 2059, or £4bn in total.

1 Introduction

Europe Economics was asked by the Employment Related Services Association (ERSA), the representative body for the employment support sector, to study the effectiveness of the Work Programme in supporting the long-term unemployed back into work and any resulting consequences for the wider economy.

The Work Programme provides personalised support, including work experience and training, for up to two years to help those who have been out of work for a prolonged period, normally at least a year. It is a payment by results scheme, with providers initially receiving an Attachment payment (although those have now been phased out) when first taking on a claimant; then receiving a Job Outcome payment when a participant is in work and off benefits for at least six months (or three months in particularly difficult cases); and then Sustainment payments every four weeks when a participant stays in work longer (for up to one year, eighteen months or two years, again depending on how far the claimant is from the labour market).

There have been nearly three hundred thousand Job Outcome payments since the programme was established (DWP, 2014). However we cannot establish the impact of the Work Programme using that data alone. The long-term unemployed do find work under their own steam without external support. Establishing the genuinely additional effects of the programme therefore requires establishing a counterfactual: how many of the long-term unemployed would have found work without the Work Programme?

Earlier analysis has focused on the extent to which the numbers finding work – triggering payments to providers – has matched the initial expectations of the DWP (NAO, 2014). Such measures of the performance of the programme against expectations — “Did the programme have as much impact as expected?” — have their own interest, but the question we address here is distinct. We consider instead the impact that the programme as implemented has had. Using prior expectations as a proxy for a counterfactual in which the Work Programme was not introduced does not capture actual wider macroeconomic conditions and other relevant circumstances.

Our goal is to provide the first ex-post analysis of the Work Programme’s performance. By using the latest labour market data available (whilst acknowledging the relatively short time period and the limitations of the data available) we have been able to study the Work Programme’s performance in both the difficult circumstances when it was first instituted and in the context of an increasingly robust economic recovery, controlling for external circumstances.

In this report we first set out the background to our analysis: the New Deal programmes which the Work Programme replaced; the design of the Work Programme itself; other welfare reforms that have been enacted; and finally the macroeconomic circumstances over the period in which it has been in place.

After that, we set out the approach that we have taken to establishing the impact of the Work Programme. First, we modelled the labour market – specifically the rate at which those who have been unemployed for a year or longer leave benefits or find work each month – and assessed the impact of the Work Programme within that model. Then we calculated likely wider consequences of that impact on the labour market.

Further work could be done to test, refine and extend our results, and we set out some of the opportunities and challenges which might face those undertaking that research, but analysis of the data already publicly available suggests that the Work Programme has had a substantial effect.

We conclude by setting out our results and their implications. Our view is that the Work Programme has materially increased the number of people in long-term unemployment leaving benefits. We expect that

will in due course offset the cost of the programme to the exchequer, is increasing the earnings of those finding work and benefiting employers enjoying the services of those workers. While there are necessarily limits to analysis of individual-level outcomes using publicly available data on aggregate outcomes, our results suggest that the Work Programme is producing tangible benefits for many participants and the wider economy.

1.1 The New Deal and Employment Zones

Before the Work Programme was introduced in 2011, in roughly half of Great Britain the Flexible New Deal was in operation (for all those unemployed for at least 12 months); in the other half other programmes such as the New Deal for Young People (for those aged 18-24 and unemployed for at least 6 months), the New Deal 25+ (for those aged 25-59 and unemployed for at least 18 months) and Employment Zones were used instead. Other voluntary programmes such as New Deal 50+, New Deal for Partners and New Deal for Lone Parents were also available. Additional programmes and support packages were also on offer to eligible individuals, including: the Young Person's Guarantee, which included the Future Jobs Fund, directed at those aged 18-24; Pathways to Work, the New Deal for Disabled People and Work Choice for those with a disability or a health condition; and the Six Month Offer package of measures.

Flexible New Deal (FND): Of those earlier policies, the FND appears to have been the most similar to the Work Programme. The FND was a compulsory employment programme for individuals of all ages who had been claiming Jobseeker's Allowance (JSA) for 12 months or more. It was run by specialist providers (like the Work Programme) who had the freedom to employ a wide range of measures that they thought were suitable to help the participant in their search for work. The assistance available included the expertise of specialist organisations, support for travel costs and training courses to improve the participant's skills.

New Deal for Young People: The functions of this scheme have been completely incorporated in the Work Programme. It was a compulsory programme for people between the ages of 18 and 24 who were claiming JSA. It was divided into three categories, which included job search advice and regular meetings with a personal adviser, enrolment on a full time education course, placement with a voluntary sector organisation or a job offer with an employer, who received a subsidy for taking on the claimant.

Employment Zones: This scheme targeted the long term unemployed in areas with high unemployment. In these zones it replaced the FND and the New Deal for Young People. The participant was assigned a personal adviser who would guide them through the three stages of the programme that involved drawing up and implementing an action plan with activities that would help the unemployed individual to find a job. This has now also been replaced with the Work Programme.

Other voluntary programmes and support schemes:

- New Deal 50+: aimed to help those aged over fifty to improve their employment prospects.
- New Deal for Lone Parents: aimed to help lone parents whose youngest child was under 16 years old.
- New Deal for Partners: run by Jobcentre Plus for partners of unemployed people claiming JSA.
- Six month offer: offers individuals of all ages who have been claiming JSA for six months extra support and opportunities.
- Young Person's Guarantee: all those aged 18 to 24 years old who reached the six month end of claiming JSA were guaranteed an offer of a job, training or work experience.
- Pathways to Work: aimed to help people with a disability or health condition to find work. It offered focused interviews with advisers and employment advice.
- New Deal for Disabled People: offered advice on job search techniques, basic training and identifying suitable job opportunities.

There were a number of assessments of the earlier New Deal programmes, for example:

- Riley & Young (2000) were amongst the first to analyse the implications of the New Deal for Young People Programme for employment and the public finances. Overall, the evidence in the report indicated that the scheme had a beneficial impact on the UK economy. The empirical findings suggested that national income was around £0.5 billion per annum higher as a consequence of the programme. Considering the impact on those leaving unemployment, the study suggested that, during the first two years of the programme (up to March 2000), a little over 200,000 young people left unemployment earlier than they would have done without the programme. Within this total, roughly 60,000 more young people moved directly into work (including subsidised jobs) than would have done without the programme. The authors used data from the New Deal Evaluation Database and produced their results with a difference-in-difference estimation.
- De Giorgi (2005) also investigated the impact of the New Deal for Young People on the UK economy and particularly whether it enhanced the employment probability of male participants. He used the eligibility rule to identify a suitable counterfactual with a regression discontinuity. Through this specification he was able to identify a local average treatment effect which constituted the impact of the New Deal for Young People on the probability of employment. The data used came from the New Deal Evaluation Database and the Juvos database. He found that the scheme enhanced employability by around six to seven per cent.
- Dolton & Smith (2011) evaluated the impact of the UK New Deal for lone parents on benefit receipt. The database used combined extracts from a number of administrative datasets maintained by the UK government and is now publicly available. They define participation as having had an initial interview during the participation window 2000-2001. The control group are all the lone parents in the sample who did not go for an initial interview. The authors adopt a “potential outcomes” evaluation framework. Their findings suggest that the programme very modestly reduced benefit receipt amongst participants.

There is therefore a high quality literature available on the effects of the New Deal, which suggests the programme increased employment. However the differing results for the scale of the impact obtained in studies of different elements of the overall New Deal suggest that the design of an employment support programme and the characteristics of the group subject to the intervention have a significant effect on the likely impact. We should therefore not assume that the results of the Work Programme will be similar to the results of the New Deal. At the same time, the methods employed in these studies depended on longitudinal data for individual participants, which is not available for the Work Programme at present.

1.2 The Work Programme

The Work Programme is delivered by a range of private, public and voluntary sector organisations, which are supporting people who are, or are at risk of becoming, long-term unemployed to find work. It replaces the earlier New Deal programmes described above.

The key characteristics of the Work Programme are:

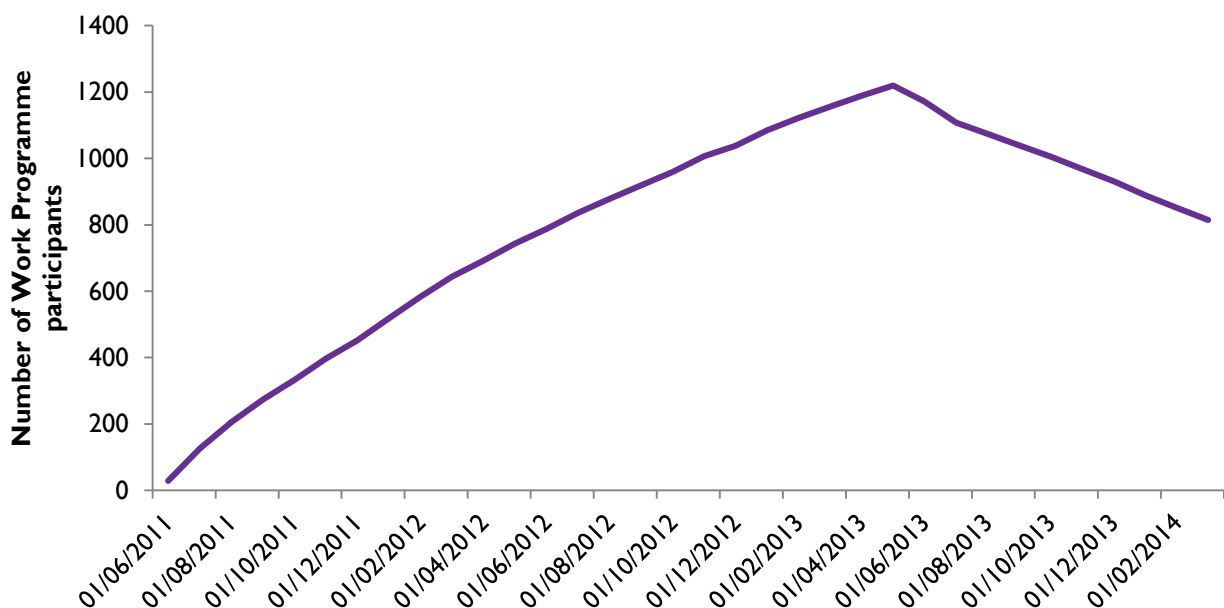
- **Payment by results:** providers are paid primarily for the results they achieve, with no up-front payments at all in the later years of the contracts. The incentives are designed to encourage service providers to help participants into sustained work, and they can be paid for up to two years for doing so. Providers can claim a job outcome payment after a participant has been in a job for three or six months, depending on how far they are from the labour market. After receiving a job outcome payment, providers can claim sustainment payments when a participant stays in work longer, up to a given limit.
- **Universality:** The Work Programme supports a wide range of participants including those who are at risk of long-term unemployment and others who are disabled or have a health condition, and who may have been out of work for several years. This is in contrast to previous UK welfare to work

programmes that have often been designed for specific groups – including for younger and older unemployed people, people with limited capability for work because of sickness or disability, and lone parents. The Work Programme is a single programme for a range of groups, which was intended to allow providers to focus on individuals and their personal challenges, rather than the type of benefit they are receiving.

- **Incentives:** Work Programme incentives are designed to drive high performance as well as to help those furthest from the labour market into sustained work. The key performance measure for providers is supposed to be the number of job outcomes as a percentage of the number of people who have started on the programme in the previous 12 months.
- **Freedom for providers to personalise support:** Previous welfare to work programmes specified in varying levels of detail what interventions providers had to deliver. The Work Programme, by contrast, gives providers far greater flexibility to design programmes that they feel will work. Rather than asking providers to make one-size-fits-all services work for a wide range of participants with varying needs, the Government hopes to give providers freedom to personalise support for the individual in a way that fits the local labour market. This is sometimes referred to as a ‘black box’ commissioning approach.

Participation rose from June 2011 and is now starting to decline as claimants complete the programme and fewer claimants are referred.

Figure I.1: Work programme participation, by month



There has been limited empirical study of the impacts of the Work Programme itself so far. Earlier research by organisations such as the National Audit Office (2014) has focused on comparing the ex-ante DWP expectations of the outcomes for participants to the final results. Though of interest in their own right, such comparisons are of limited relevance to our purposes here as using prior expectations as a proxy for a counterfactual in which the Work Programme was not introduced does not capture actual macroeconomic conditions and other relevant circumstances. There has not been any other ex-post evaluation of the impact of the programme of which we are aware, besides the basic statistical releases from the Department (DWP, 2014).

1.3 Other welfare reforms

It is important to note that the Work Programme has not been implemented in isolation. At the same time a number of other changes have been made, including:

- **The Universal Credit:** aims to improve the incentive to work and make benefits simpler. There have been considerable technical challenges in implementing the Universal Credit.
- **Employment Support Allowance (ESA):** replaces Incapacity Benefit (IB) and is intended to increase the number of those with chronic long-term health conditions finding work, or encourage them to find limited work rather than remaining out of work entirely.
- **Personal Independence Payments (PIP):** replace Disability Living Allowance (DLA) and the new benefit is intended to increase scrutiny over disability claims and take better account of changing circumstances over time, in order to focus resources on those most in need of support.
- **Housing Benefit Cap and overall Benefit Cap:** there are now limits to the amount that can be claimed in Housing Benefit and in benefits overall, depending on the make-up of the household concerned. The overall cap does not apply to benefits for those in work, which means it may create a significant incentive to find work, at least in London where it is most likely to be relevant.

Those reforms have all been the subject of extensive debate. That debate is not directly relevant to a consideration of the impact of the Work Programme, but the other reforms are relevant in two ways.

First, because it could be difficult to separate the effects of the Work Programme from the effects of those other reforms. It might be that the incentive to work created by the Benefit Cap – for example – is needed before claimants will make full use of the support available under the Work Programme and its effects become apparent (the different reforms might be complementary). The reverse could also be true: increasing the incentive to find work might only be effective if there is a scheme like the Work Programme, which supports those seeking to respond to that incentive. Finally there is the simpler possibility that the effects of other welfare reforms might obscure the effects of the Work Programme.

Second, because the Work Programme might be seen as necessary in order for those reforms to be morally or politically acceptable. It might be felt, for example, that it was not fair to designate many of those previously regarded as incapacitated as fit for some work, if there was not then support to help them find work (particularly if they have spent significant periods of time outside the workforce and are poorly prepared to enter it).

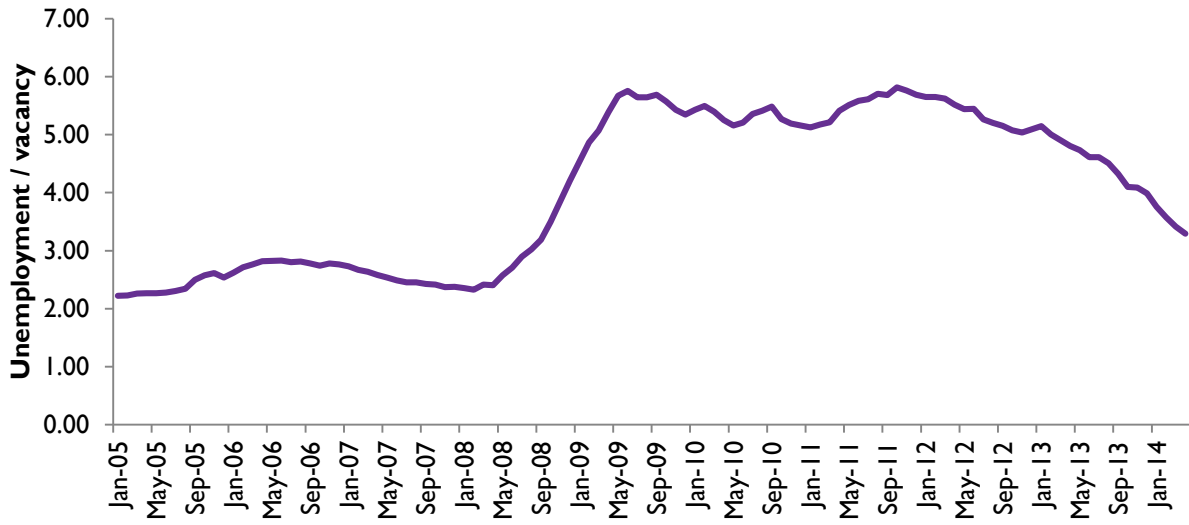
Other changes therefore complicate any analysis of the Work Programme's success or failure. It is best understood as a part of a wider welfare reform agenda.

1.4 Wider macro-economic performance

The Work Programme was implemented in 2011, in the aftermath of a global recession in 2009 from which the UK economy struggled to recover. In its first full year of operation the unemployment rate was 7.9 per cent and the claimant count was 1.59 million. The circumstances were not promising for an attempt to find work for the long-term unemployed, with significant competition for each job as the number of unemployed people per vacancy had risen from around 2.5 in mid-2007 to more than 5.5 in mid-2011.

Since then the economy has begun to recover strongly. In April 2014, there were 3.3 unemployed for every vacancy and the ratio had been steadily falling for around 18 months (ONS, 2014).

Figure I.2: Unemployment, per vacancy

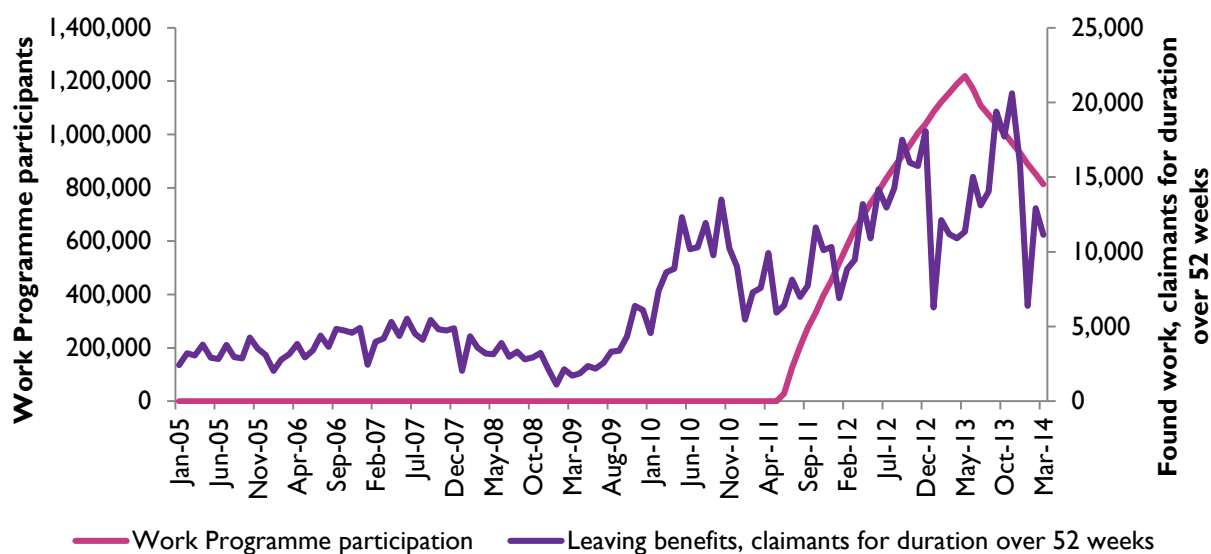


Using monthly data over a period beginning before the Work Programme was introduced and ending in April 2014, we are able to study the performance of the Work Programme both in the difficult circumstances in which it was first introduced and in the recovery that took place from late 2013.

2 Our Approach

A simple comparison of the dates at which the Work Programme came into operation and the dates at which large numbers of the long-term unemployed started to leave benefits suggests that the Work Programme may have had an effect (ONS, 2014).

Figure 2.1: Leaving benefits and Work Programme participation



However a number of other changes took place in the labour market over the same period, particularly:

- The macroeconomic environment started to improve, with an increasingly robust recovery after a prolonged period of stagnation following the financial crisis and recession, which meant increased vacancies.
- Other welfare reforms were implemented. Other policy changes also took place, such as the lifting of the Personal Allowance for Income Tax, which would increase the returns on finding work.

We therefore need to control for those changes as far as possible if we are to produce a robust estimate of the additional job starts associated with the programme.

Our approach to studying the Work Programme therefore involves two steps:

1. Constructing a working model of the rate at which long-term claimants (over 52 weeks) leave benefits or find work each month, which controls for the general macroeconomic environment, other policy changes and unobserved factors via what are called “time series” components — namely variables that embody the ways these factors affected the variable in the past. The impacts of the work programme and the key fundamental observable causal factor — i.e. the vacancy rate — are controlled for separately.
2. Estimating the wider impacts associated with additional job starts and applying those results to the findings from the labour market model to estimate the aggregate impact.

2.1 Constructing labour market model

We produced time series models, based on monthly data from January 2005 to April 2014, giving 111 observations before adjustments. There are further details on specification of the statistical models in the Technical Annex.

Table 2.1: Multivariate regression, impact on rate long-term unemployed (over 52 weeks) finding work

Model	R ²	Coefficient	Number of job starts attributed to Work Programme	95% confidence interval	
Model A - preferred	0.57	0.0054	107,000	-1.73E-05	0.010833
Model B – sparse	0.50	0.0059	117,000	0.000646	0.011177
Model C – “programmes” version	0.55	0.0062	122,000	0.000347	0.011983
Model D – “found work”	0.69	0.0042	84,200	0.001098	0.007410

2.1.1 Dependent variable

The Work Programme is intended for the long-term unemployed, those out of work for a year or more (or nine months for those between 18 and 24 years old). We have therefore used JSA off-flows for claimants who have been out of work for more than 52 weeks as the dependent variable for our analysis. It is not clear how reliable we should consider the categorisation of those off-flows by reason. Furthermore, the variable for the number who find work is non-stationary, which undermines the reliability of that regression. Hence, as an additional cross-check, we report the results of an additional model (Model D) based upon just those that were reported to have found work. There is a consistent series for the relevant dependent variable available on a monthly basis (ONS, 2014). Our analysis was then based on the rate: that number divided by the number of people who were long-term unemployed in each month.¹

There may also be an effect on the chances of young people out of work for between 39 and 52 weeks finding work, but we do not believe that will have a significant effect on the overall results and the availability of data on the numbers leaving benefits between nine and twelve months is more limited.

ESA claimants are also included in the Work Programme. Due to a combination of weaknesses in the data (which is only available on a quarterly basis); the greater difficulty in securing work for the disabled, which would mean the relationship between participation and off flows was weaker; and the smaller proportion of the claimant population subject to the intervention, we were not able to identify a statistically significant relationship between ESA off-flows and participation in the Work Programme. We therefore only identify an impact of the Work Programme for JSA claimants. That may include many judged fit for work under the Work Capability Assessment (the new test applied to ESA claimants) who would previously have been able to claim Incapacity Benefit. Further data would be required to explore the relationship between ESA claimants and the Work Programme.

The programme could – in theory – affect the chances of those out of work for less than 52 weeks finding work. It might increase their chances of finding work because some claimants, who have been supported by the Work Programme in the past, are better equipped to find work; because the work done by those

¹ There is some distortion in the number of young term people on JSA for longer durations, resulting from how they were classified while on the New Deal (DWP, 2012). That distortion will particularly affect the denominator for the rate at which long-term unemployed people find work. However we believe that the effect on our final results will not be too severe as it only affects those aged 18-24 and should, at least in part, be captured by the controls.

finding jobs through the Work Programme is complementary to other jobs, allowing firms to expand and take on other new workers; or because those unemployed and coming up to the one-year point at which they will be attached to the Work Programme find work or otherwise cease claiming benefit to avoid the time commitment they expect to be associated with participation in the programme. On the other hand it might decrease their chances of finding work because Work Programme participants take up scarce jobs.

Our implicit assumption in this research is that those effects would not significantly alter our overall results and we can therefore concentrate on the effect on those claiming for more than 52 weeks. We tested with a simple regression and found a positive relationship between participation in the Work Programme and the number of those claiming for less than 52 weeks finding work. That suggests focusing on those unemployed for more than 52 weeks is a reasonable, conservative choice and there is not a displacement effect which might seriously undermine our estimate of the net impacts of the programme.

The rate at which long-term claimants leave benefits will also vary substantially from region to region, and the circumstances in each region may mean that the impact of the Work Programme varies considerably by region as well, however that was outside the remit of our research. Regional effects might be another avenue for further research.

2.1.2 Work Programme variable

There were three options for how we could include the Work Programme in our model:

- **Dummy.** The dummy variable approach (our preferred approach) attempts to capture whether the Work Programme is in place (in which case the dummy has a value of 1) or not (in which case the dummy has a value of zero). We define the Work Programme as being in place as the point in time at which half of those that have so far been attached under the programme had been attached.
- **Work Programme spending.** We could measure the amount spent on the Work Programme. In theory, spending decisions are closest to the original exogenous decision. However in practice, with a payment by results programme the amount spent is highly endogenous to the numbers finding work – our dependent variable – and a measure based on spending would therefore not be appropriate.
- **Work Programme participation.** Another option would be to define the Work Programme as having a degree which depends upon how many net attachments there are in any period. The drawback of this for our purposes is that, because the Work Programme is time limited, each individual can only participate once, and our data window covers the period before participation had stabilised relative to the level of long-term unemployment, our series contains a drop in net attachments in the latter part of the series that reflects the initial cohort from the programme leaving — which would create a spurious fall in the degree of participation if defined in this otherwise-attractive way.

2.1.3 Potential control variables

The existing literature suggests a number of factors which might affect unemployment or the chances of the unemployed finding work. A number of relevant studies are summarised in Table 2.2.

Table 2.2: Factors affecting unemployment or the chances of claimants finding work

Title	Authors	Year	Method	Findings
Past and prospective causes of high unemployment	Krugman, P.	1994	Generally descriptive paper on what may have led to the dramatic increase in unemployment during the second part of the 20 th century.	Level of unemployment benefits, by increasing the reservation wage, human capital and technological changes.
Unemployment flows in Finland, 1969 – 95:	Eriksson, T. and Pehkonen, J.	1998	Time series analysis.	Job opportunities, unemployment compensation,

Title	Authors	Year	Method	Findings
A time series analysis				demographic structure and emigration.
The European unemployment dilemma	Ljungqvist, L. and Sargent, T.	1998	General equilibrium model, where skills are gained while working and then lost during unemployment. Unemployment benefits also form a part of this model, so that the effects of labour supply on unemployment are considered.	Human capital, time out of work (which erodes skills).
The causes and consequences of long-term unemployment in Europe	Machin, S. and Manning, A.	1998	Hazard rate analysis of the outflow rate from unemployment.	Flow of vacancies, human capital (depreciates with time out of work), reservation wage.
Re-employment probabilities of young workers in Spain	Alfonso Alba-Ramirez	1998	Multinomial Logit.	Education, age, willingness to relocate/accept lower wage, seasonal variables.
How changes in benefits entitlement affect job-finding: Lessons from the Slovenian “experiment”	Van Ours, J. and Vodopivec, M.	2004	Twinned similar workers into treatment and control groups. Compared the hazard rate between the treatment and control groups.	Unemployment benefits, time limit on unemployment benefits.
Evaluating the Impact of Job Training Programs in Latin America: Evidence from IDB funded operations	Pablo Ibararán, David Rosas Shady	2008	Controlled group OLS regressions and instrumental-variable specifications; difference-in-difference.	Age, gender, region, education, earnings and hours worked.
Job Search and Unemployment Insurance: New Evidence from Time Use Data	Alan B. Krueger, Andreas Mueller	2008	Regression.	Unemployment benefits, type of unemployment, education, sex, marriage status.

On the basis of that prior literature, we considered a number of variables for potential inclusion in our labour market model:

- **Vacancies** (ONS, 2014). The number of vacancies is the principal mechanism by which wider macroeconomic circumstances can affect the number of those unemployed who find work. The change in vacancies may be particularly relevant as it might better reflect an increase or decrease in the availability of new jobs, rather than other issues such as skills mismatches. This is included in our model.
- **Unemployment** (ONS, 2014). If more people are unemployed, then there might be more competition for a given number of vacancies, making it more difficult for the long-term unemployed to find work. Again the change in unemployment may be more relevant than the level. Long-term unemployment appears in our model as the denominator for the dependent variable.
- **Other programmes**. We tested including the New Deal, defined by a similar dummy variable to that used for the Work Programme, but found that it was not statistically significant. We also investigated other models in which the New Deal, considered in isolation, was statistically significant, but they were not robust. Model C considers the impact of both programmes (the Work Programme and the New Deal) together.

2.2 Effects

After estimating the number of job starts associated with the Work Programme, by multiplying the change in the rate leaving benefits or finding work for each month by the number long-term unemployed, our next task was to estimate the wider effects of that labour market impact. At that stage we necessarily had to come to reasonable assumptions and produce relatively simple estimates, as precisely estimating wider economic impacts would itself be a highly involved task which falls outside the scope of this project.

In order to explore the wider effects, we took three steps:

- Estimate indicative profiles for claimants, weights for each profile and the effects of a rise in earnings on claimant take-home pay and benefit entitlement for workers and the exchequer.
- Estimate the likely associated rise in corporate earnings.
- Estimate scenarios for the future, based on those workers either remaining at the minimum wage or converging on average earnings, and discount to give the present value (PV) of the impacts.

As these calculations are necessarily simpler than the econometric estimates above, we have attempted to make conservative assumptions at each stage.

2.2.1 Claimant profiles

Labour earnings benefit both the worker, who takes home higher pay and is able to enjoy a higher standard of living, and the exchequer, thanks to higher tax revenue and the withdrawal of benefits. Workers may keep only a small proportion of the earnings paid by their employer, depending on their circumstances. In order to understand the likely distribution of the effects of the Work Programme we have constructed three representative profiles and weighted them in our final analysis based on the makeup of the JSA claimant population.

DWP (2014) statistics suggest that, as of November 2013, the JSA claimant population had the following characteristics:

- Most of claimants are male, 64 per cent of total claimants.
- 25 per cent of claimants are ages 18-24; 26 per cent of claimants are aged 25-34; and around 20 per cent of claimants are aged 35-44.
- 77 per cent of claimants do not have any children, 9 per cent have one child and 11 per cent have two or more children. The rest did not report a number of children.
- 11 per cent of claimants indicate they have a partner. Others either choose not to reveal whether they have a partner or indicate that they do not have a partner.
- The local authority with the most claimants is Birmingham, at 3.6 per cent, followed by Leeds at 1.7 per cent and Glasgow City at 1.6 per cent. London as a whole accounts for 15 per cent of all claimants.

Based on that information, we have produced three profiles. For all three profiles, the following is true:

- Applicants are British or Irish citizens who are not living abroad.
- They are not in hospital / residential care.
- They are not students.
- They do not have disabilities.
- They are not caring for someone who is sick or disabled.
- They are not receiving special benefits (e.g. war pensions).
- The rent is based on the Local Housing Allowances for a given area.
- The weekly earnings from going back to work are calculated by multiplying the minimum wage (£6.31 for those aged 21 and above, £5.03 for those aged under 21) by 37 hours.

- Council tax brackets were calculated by finding a postcode with an appropriate rent using a property search website. These postcodes were then entered into either the Valuation Office Agency or the Scottish Assessor Association's website to find the appropriate tax band.

As the model is concerned with people who have been out of job for more than 52 weeks, all the profiles are for people who are not working and have not worked for the past two years.

For the family profile, we assume the claimant and the claimant's partner are of the same age and the partner is assumed to be economically inactive as the main purpose of this profile is to capture child benefits. One of the children is assumed to be a one-year-old boy, and the other is assumed to be a seven-year-old girl.

The two single profiles are both assumed to have a one-bedroom property. The family profile assumes a two-bedroom property.

The profiles, their weighting within our calculations, and the benefits to the worker and the government when they are in work – at the minimum wage – are given in Table 2.3.

Table 2.3: Claimant profiles

Profile	Weighting	Annual increase in earnings after tax and benefits withdrawal	Annual income after tax and benefits withdrawal	Annual benefits to the government	Implied average withdrawal rate
Single over 25, Glasgow	50%	£4,457	£11,236	£6,779	60%
Family, Birmingham	20%	£4,613	£11,236	£6,623	59%
Single under 25, London	30%	£6,507	£9,497	£2,990	31%

2.2.2 Corporate earnings

Producing goods and services requires labour and capital. The Cobb-Douglas production function is a simple model used to estimate output within an economy. It considers capital and labour as the only inputs to output. These are augmented by a total factor productivity term, where this represents changes in output not directly attributable to changes in capital and labour. Overall, the Cobb-Douglas production function takes the following form:

$$Y = A * K^{\alpha} * L^{\beta}$$

Where A represents total factor productivity, K represents the stock of capital, L represents the stock of labour and α and β represent the output elasticities for capital and labour. The elasticities for capital and labour are represented by the share of output attributable to capital and labour. The Cobb-Douglas model typically assumes constant returns to scale, meaning that an equivalent increase in the usage of capital and labour will result in an equivalent increase in output. For the model to demonstrate constant returns to scale, the sum of α and β must equal one.

Under those assumptions, we can estimate the increase in overall GDP and capital income which are likely to be associated with an increase in labour earnings. The labour share of income, α , averaged around 62 per cent of GDP between 2000 and 2009 according to Bank of England estimates (Faccini & Hackworth, 2010).

As a result, the share of income attributable to capital, beta, is 38 per cent. Changes in GDP should therefore be attributed to labour and capital in these ratios. The Cobb-Douglas production function used to model the UK economy is therefore as follows:

$$Y = A * K^{0.38} * L^{0.62}$$

Using these figures for alpha and beta, it is possible to calculate the benefit to capital by taking the overall sum of the changes in labour income.

Capital income is also subject to taxes, like the labour income. The best estimate of the likely share taken by government is the implicit tax rate on capital, estimated to be 35.7 per cent in the UK in 2012. We can assume that the remaining 64.3 per cent of that capital income goes to either shareholders or possibly consumers.

2.2.3 Future scenarios

Of course, not all those who find work will remain in work. For the purposes of our estimates here, we have assumed that there are two groups: around two thirds of those finding work are not successful in work, are in employment for a negligible amount of time and are associated with no extra income for themselves, the exchequer or business; a third are thereafter only unemployed for the same share of their working lives as the average across the wider population (we estimate this using the 1994-2013 average unemployment rate of 6.6 per cent). Those ratios are based on the share of those Work Programme participants who have a spell off benefits whose spell on benefits is for longer than six months.

It is important to note that the assumptions for the less successful are almost certainly too pessimistic. There will have been some value associated with their spell off benefits: reduced benefit claims and higher labour and capital earnings. At the same time, though, the assumptions for the more successful group may be too optimistic. Work Programme participants may remain at the margins of the labour market and show a greater propensity to unemployment over the rest of their career. Our view is that the pessimism in these assumptions for two thirds of those finding work and the optimism for the other third of those finding work should approximately balance out to a reasonable, conservative estimate.

We have then developed three scenarios for those who remain in work:

- a pessimistic scenario in which those workers remain at the minimum wage for the rest of their career;
- an optimistic scenario in which they attain average earnings in two years; and
- a central scenario that is half way between the pessimistic and optimistic case.

We believe that these assumptions give a reasonable approximation of the long-term value of job starts under the Work Programme. We then discounted the results to 2014 present values – at a standard discount rate of 3.5 per cent (HM Treasury, 2003) – to give the best comparison possible to the £1.4bn reported to have been spent on the Work Programme by March 2014 (DWP, 2014). It is important to note, for that comparison, that our estimate includes no job starts for the substantial body of ESA claimants, as discussed in Section 2.1.1.

2.3 Further research

Our research provides a robust time series study of the impact of Work Programme participation. The most potent avenue for future research to test or refine our results is to obtain anonymised, longitudinal data for individual claimants. That would allow the development of a quasi-experimental study, which might be better able to identify the impact of Work Programme participation on the chances of employees finding work, and their fortunes afterwards.

Several departments, particularly the DWP and the HMRC, are working together to pool information and build up a longitudinal database for claimants, and that database is being used in the assessment of the results of other labour market interventions, such as the Next Steps skills programme.

The challenge in producing such a study would be to identify a natural experiment, probably resulting from a quirk in the qualification criteria for the Work Programme. The study might take a regression discontinuity approach, looking at workers who nearly qualify for the scheme, or a nearest neighbour approach, looking for workers as similar as possible in a range of other characteristics to those who qualify for the Work Programme, in order to identify its effects. There would be challenges in identifying a suitable control group under either of those approaches, but they would offer the most robust possible study of the impact.

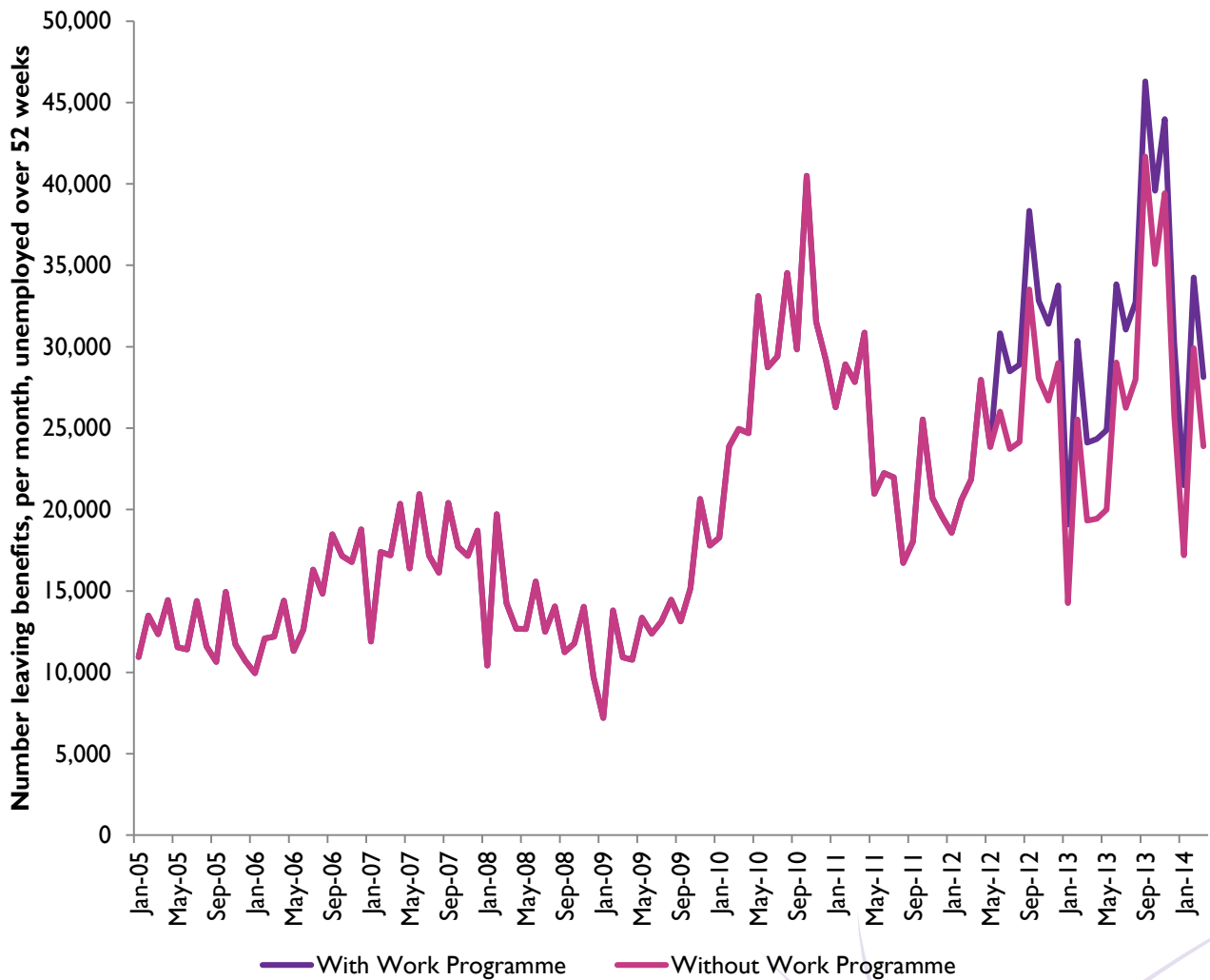
Another obstacle to such a study may be uncertainty over the distribution of the benefits of the Work Programme over time. As discussed earlier, it is possible that claimants might find work or otherwise cease claiming benefits before entering the Work Programme intervention, in order to avoid the time commitment it can entail. They equally might find work more easily later on as a result of human capital built up in the programme (for example, skills developed in training courses).

However our view is that those problems probably can be overcome and, when more detailed data is available, it will be possible to produce a new estimate of the efficacy of the Work Programme. Hopefully this research is a first step in assessing its impact and will be refined over time.

3 Results

Our key finding is that the Work Programme has increased the cumulative number leaving benefits for those unemployed for over 52 weeks above the expected level by around 100,000 over the period from June 2011 to April 2014. The Work Programme is therefore responsible for around ten per cent of all job starts for those long-term unemployed workers in that period.

Figure 3.1: Work Programme labour market impact



The potential wider effects are set out in Tables 4.1 and 4.2. Our central projection for the present value of the benefits associated with the programmes is around £18bn. It may be difficult to help the long-term unemployed find work but, even with the assumption that only a minority are then able to sustain themselves in the labour market, the long-term benefits can be substantial.

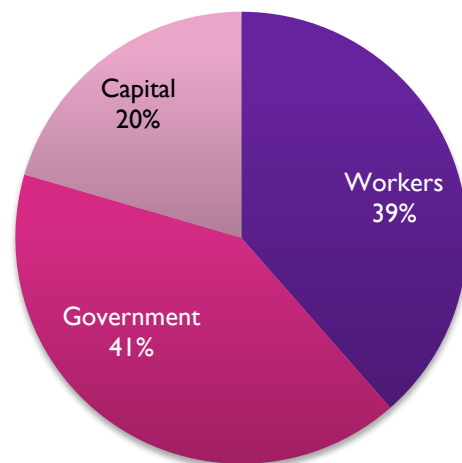
Table 3.1: Work Programme, average annual wider benefits, PV in 2014, 2011-2059

Scenario	Workers	Government	Capital	Total
Pessimistic	£50m	£120m	£40m	£210m
Central	£140m	£140m	£80m	£370m
Optimistic	£240m	£170m	£120m	£530m

Table 3.2: Work Programme, total wider benefits, PV in 2014, 2011-2059

Scenario	Workers	Government	Capital	Total
Pessimistic	£2.2bn	£5.8bn	£1.9bn	£9.9bn
Central	£6.8bn	£6.9bn	£3.8bn	£17.6bn
Optimistic	£11.4bn	£8.1bn	£5.8bn	£25.3bn

The largest share of the benefits goes to the exchequer in the form of higher labour and capital taxes and lower benefit payments at around £7bn over the working lifetime of those involved. The Government can therefore expect to more than recoup the around £1.4bn spent on the programme (including ESA claimants) so far (DWP, 2014) over time. Workers benefit by a similar amount. The capital income associated with the scheme is smaller but still significant. The breakdown of the benefits, in the central case, can be seen in Figure 3.2.

Figure 3.2: Benefits, by group

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Technical Annex



Europe Economics

5 Technical Annex: Regression Method

5.1 Models

Our results are based on a time-series model for the number of people unemployed for a year or longer finding work, as a percentage of the total number of long-term unemployed. In such a model, many complex structural features of the economy are embodied within and proxied by the value of the dependent variable in earlier periods, through so-called “autoregressive” (AR) and “moving average” (MA) components.

Further research – ideally using longitudinal data for individual claimants – particularly when the Work Programme has been in place for a longer period of time, would be worthwhile, but we believe 100,000 is a robust estimate of the additional job starts based on the data available at this point. Results of a similar order of magnitude are found under a simpler, more parsimonious model; in a model that elides the Work Programme with the earlier New Deal; and in a further model (which though, as we shall see, has technical weaknesses, is reported for interest) that focuses on the specific subset of those leaving benefits most likely to have been helped by the Work Programme.

5.1.1 Model A – preferred

Our main model includes eight components:

- The dummy for the Work Programme being in place (WVP), defined as explained in the main text.
- The change in the number of vacancies per person long-term unemployed (VACANCIES). The difference in the number of vacancies was preferred as it addressed a potential problem of non-stationarity in this variable and may reflect the economic logic of the role of vacancies, as mentioned earlier.
- A constant (C).
- Autoregressive terms at a lag of one (AR(1)) and two months (AR(2)) and an autoregressive term at a lag of twelve months to reflect seasonality (AR(12)).
- Moving average terms at a lag of one month (MA(1)) and two months (MA(2)).

The model is preferred because:

- It most closely reflects the underlying no-controls time series process (which is ARMA(2,2)).
- It includes a variable — the vacancies rate — which we have strong economic theory reasons to believe must play a causal role in affecting the dependent variable.

We observe that of our models this has the most negative Akaike information criterion value, indicating that it is parsimonious in its use of the data available (the additional variables are not adding significance via over-fitting). At just under 60 per cent, the R^2 of our model implies that it has significant explanatory power.

Table 5.1: Model A results

Dependent Variable: FOUND_WORK
 Method: Least Squares
 Sample (adjusted): 2006M02 2014M04
 Included observations: 99 after adjustments
 Convergence achieved after 21 iterations

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)
 MA Backcast: 2005M12 2006M01

Variable	Coefficient	Std. Error	t-Statistic	Prob.
WP	0.005408	0.002731	1.980044	0.0507
VACANCIES	0.046933	0.023757	1.975534	0.0512
C	0.031445	0.005712	5.504782	0.0000
AR(1)	-0.054873	0.073782	-0.743722	0.4590
AR(2)	0.743781	0.076995	9.660121	0.0000
AR(12)	0.146241	0.073757	1.982743	0.0504
MA(1)	0.611054	0.139472	4.381201	0.0000
MA(2)	-0.388626	0.142442	-2.728317	0.0076
R-squared	0.565867	Mean dependent var		0.034212
Adjusted R-squared	0.532472	S.D. dependent var		0.009227
S.E. of regression	0.006309	Akaike info criterion		-7.216210
Sum squared resid	0.003623	Schwarz criterion		-7.006503
Log likelihood	365.2024	Hannan-Quinn criter.		-7.131362
F-statistic	16.94476	Durbin-Watson stat		2.227409
Prob(F-statistic)	0.000000	Wald F-statistic		3.319874
Prob(Wald F-statistic)	0.040585			
Inverted AR Roots	.96 .44-.68i -.44+.68i	.78+.36i -.00+.80i -.79-.36i	.78-.36i -.00-.80i -.79+.36i	.44+.68i -.44-.68i -.98
Inverted MA Roots	.39	-1.00		

5.1.2 Model B – sparse

Our sparse model contains only four components:

- The dummy for the Work Programme being in place (WP)
- A constant (C).
- Autoregressive terms at a lag of one (AR(1)).
- Moving average terms at a lag of one month (MA(1)).

For the reasons explained above, we prefer our richer main model to this parsimonious variant. However this is a useful cross-check, producing a very similar coefficient on the main variable of interest, suggesting our findings are robust to this simpler specification.

Table 5.2: Model B results

Dependent Variable: FOUND_WORK
 Method: Least Squares
 Date: 08/27/14 Time: 17:08
 Sample (adjusted): 2005M02 2014M04
 Included observations: 111 after adjustments
 Convergence achieved after 22 iterations
 HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)
 MA Backcast: 2005M01

Variable	Coefficient	Std. Error	t-Statistic	Prob.
WP	0.005912	0.002656	2.225672	0.0281

C	0.032327	0.004142	7.804021	0.0000
AR(1)	0.924187	0.044584	20.72906	0.0000
MA(1)	-0.561225	0.103267	-5.434677	0.0000
R-squared	0.495343	Mean dependent var		0.034892
Adjusted R-squared	0.481194	S.D. dependent var		0.009153
S.E. of regression	0.006593	Akaike info criterion		-7.170249
Sum squared resid	0.004651	Schwarz criterion		-7.072609
Log likelihood	401.9488	Hannan-Quinn criter.		-7.130639
F-statistic	35.00838	Durbin-Watson stat		2.150508
Prob(F-statistic)	0.000000	Wald F-statistic		4.953615
Prob(Wald F-statistic)	0.028133			
Inverted AR Roots	.92			
Inverted MA Roots	.56			

5.1.3 Model C – programmes

Our third model includes eight components:

- A dummy for the presence of an employment programme (the Work Programme or the New Deal) being in place (WPND) — there was a period in the data in which neither programme is present. The New Deal is defined as being in place in the period until the number participating fell to half the average participating before the programme began to be wound down.
- The change in the number of vacancies per person long-term unemployed (VACANCIES).
- A constant (C).
- Autoregressive terms at a lag of one (AR(1)) and two months (AR(2)) and an autoregressive term at a lag of twelve months to reflect seasonality (AR(12)).
- Moving average terms at a lag of one month (MA(1)) and two months (MA(2)).

This model makes less efficient use of the information available. It is of interest, however, partly as a robustness cross-check (which the main result passes in that the coefficient in Model C remains fairly similar to that in our main model) and partly because it assists with the interpretation of our main models. We see that in this model the coefficient on the WPND variable is somewhat higher than in our main model, indicating that it is likely that, whilst both the Work Programme and the New Deal had an impact upon job starts, the Work Programme provided an additional impact over-and-above that of the New Deal.

Table 5.3: Model C results

Dependent Variable: FOUND_WORK
 Method: Least Squares
 Date: 08/27/14 Time: 18:28
 Sample (adjusted): 2006M02 2014M04
 Included observations: 99 after adjustments
 Convergence achieved after 147 iterations
 HAC standard errors & covariance (Bartlett kernel, Newey-West fixed
 bandwidth = 4.0000)
 MA Backcast: 2005M12 2006M01

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.028831	0.005435	5.304526	0.0000
WPND	0.006165	0.002929	2.104845	0.0381
VACANCIES	0.050938	0.016513	3.084799	0.0027
AR(1)	-0.032905	0.108678	-0.302775	0.7628
AR(12)	0.251658	0.094167	2.672468	0.0089

AR(2)	0.602954	0.127095	4.744107	0.0000
MA(1)	0.494496	0.133690	3.698842	0.0004
MA(2)	-0.260317	0.158988	-1.637341	0.1050
<hr/>				
R-squared	0.553948	Mean dependent var	0.034212	
Adjusted R-squared	0.519636	S.D. dependent var	0.009227	
S.E. of regression	0.006395	Akaike info criterion	-7.189124	
Sum squared resid	0.003722	Schwarz criterion	-6.979417	
Log likelihood	363.8616	Hannan-Quinn criter.	-7.104276	
F-statistic	16.14457	Durbin-Watson stat	2.124909	
Prob(F-statistic)	0.000000	Wald F-statistic	7.662567	
Prob(Wald F-statistic)	0.000840			
<hr/>				
Inverted AR Roots	.96	.81+.40i	.81-.40i	.46-.73i
	.46+.73i	-.00+.85i	-.00-.85i	-.46-.73i
	-.46+.73i	-.82-.40i	-.82+.40i	-.98
Inverted MA Roots	.32	-.81		

5.1.4 Model D – job starts

Our fourth model includes eight components:

- The dummy for the Work Programme being in place (WVP), defined as explained in the main text.
- The change in the number of vacancies per person long-term unemployed (VACANCIES). The difference in the number of vacancies was preferred as it addressed a potential problem of non-stationarity in this variable and may reflect the economic logic of the role of vacancies, as mentioned earlier.
- A constant (C).
- Autoregressive terms at a lag of one (AR(1)) and two months (AR(2)) and an autoregressive term at a lag of twelve months to reflect seasonality (AR(12)).
- Moving average terms at a lag of one month (MA(1)) and two months (MA(2)).

The only difference between Models A and D is that Model D uses as its dependent variable the specific group, within the group who have left benefits, who are reported to have found work. Model A has important advantages that suggest it should be preferred to Model D, in particular that: (i) it might capture additional job starts which were not properly recorded; and (ii) the dependent variable in Model D is non-stationary. Nonetheless, the results of Model D are reported for interest and as a cross-check.

The modest difference in the key results between this Model D and Model A should not be a surprise. The time series components in the model should implicitly pick up any environmental factors that do not change over time, which will include the rate at which people leave benefits because – for example – they retire, which in turn is likely to be more stable over time than the number of long-term unemployed finding work. The estimated impact is expressed in percentage points of the long-term unemployed in both Model A and Model D, and therefore the interpretation of the coefficient is the same.

Table 5.4: Model D results

Dependent Variable: FOUND_WORK
 Method: Least Squares
 Date: 10/20/14 Time: 14:21
 Sample: 2006M02 2014M04
 Included observations: 99
 Convergence achieved after 110 iterations
 HAC standard errors & covariance (Bartlett kernel, Newey-West fixed
 bandwidth = 4.0000)

MA Backcast: 2005M12 2006M01

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUMMY_WP	0.004254	0.001589	2.677321	0.0088
D(X)	0.016163	0.005676	2.847531	0.0054
C	0.010659	0.002216	4.810759	0.0000
AR(1)	-0.118021	0.173246	-0.681233	0.4975
AR(2)	0.438776	0.132547	3.310357	0.0013
AR(12)	0.445915	0.132076	3.376208	0.0011
MA(1)	0.744879	0.190011	3.920196	0.0002
MA(2)	-0.031649	0.178808	-0.177000	0.8599
R-squared	0.686213	Mean dependent var		0.011102
Adjusted R-squared	0.662076	S.D. dependent var		0.004456
S.E. of regression	0.002590	Akaike info criterion		-8.996860
Sum squared resid	0.000610	Schwarz criterion		-8.787154
Log likelihood	453.3446	Hannan-Quinn criter.		-8.912013
F-statistic	28.42940	Durbin-Watson stat		2.013383
Prob(F-statistic)	0.000000	Wald F-statistic		9.892455
Prob(Wald F-statistic)	0.000130			
Inverted AR Roots	.97	.83+.44i	.83-.44i	.47+.78i
	.47-.78i	-.01-.90i	-.01+.90i	-.49+.77i
	-.49-.77i	-.85-.43i	-.85+.43i	-1.00
	Estimated AR process is nonstationary			
Inverted MA Roots	.04	-.79		

5.2 Stationarity analysis

5.2.1 Dependent variable

The results of the Augmented Dickey-Fuller (ADF) test for the dependent variable for Models A-C, the rate at which people leave benefits (denoted Y for notational simplicity) are provided below.

Table 5.5: ADF Stationarity Test (intercept only) for the rate of job starts

Null Hypothesis: Y has a unit root		
Exogenous: Constant		
Lag Length: 1 (Automatic - based on SIC, maxlag=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.001119	0.0379
Test critical values:		
1% level	-3.490772	
5% level	-2.887909	
10% level	-2.580908	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(Y)
 Method: Least Squares
 Sample (adjusted): 2005M03 2014M04
 Included observations: 110 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.229904	0.076606	-3.001119	0.0033
D(Y(-1))	-0.411044	0.087182	-4.714790	0.0000
C	0.007929	0.002745	2.888693	0.0047
R-squared	0.335771	Mean dependent var		-8.27E-05
Adjusted R-squared	0.323355	S.D. dependent var		0.008030
S.E. of regression	0.006605	Akaike info criterion		-7.174986
Sum squared resid	0.004668	Schwarz criterion		-7.101337
Log likelihood	397.6242	Hannan-Quinn criter.		-7.145114
F-statistic	27.04449	Durbin-Watson stat		2.186570
Prob(F-statistic)	0.000000			

Based on the results shown in Table 5.5 we can reject the null hypothesis that the rate of job starts has a unit root at the 95 per cent significance level. For completeness we have reported a version of the ADF test with the inclusion of the trend (see Table 5.6). We notice that under this this alternative test specification we cannot reject the null hypothesis of unit root. However, a comparison of the Akaike and Schwarz Criterion values reported in Table 5.5 and Table 5.6, and the fact that the coefficient of the trend variable in Table 5.6 is not significant, lead us to rely more heavily on the test results of Table 5.5.

Table 5.6: ADF Stationarity Test (trend and intercept) for the rate of job starts

Null Hypothesis: Y has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 1 (Automatic - based on SIC, maxlag=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.035984	0.1274
Test critical values:		
1% level	-4.043609	
5% level	-3.451184	
10% level	-3.150986	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(Y)
 Method: Least Squares
 Sample (adjusted): 2005M03 2014M04
 Included observations: 110 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.247532	0.081533	-3.035984	0.0030
D(Y(-1))	-0.401873	0.088569	-4.537380	0.0000
C	0.009313	0.003490	2.668526	0.0088
@TREND("2005M01")	-1.36E-05	2.11E-05	-0.645031	0.5203
R-squared	0.338368	Mean dependent var		-8.27E-05
Adjusted R-squared	0.319642	S.D. dependent var		0.008030
S.E. of regression	0.006623	Akaike info criterion		-7.160722
Sum squared resid	0.004650	Schwarz criterion		-7.062523

Log likelihood	397.8397	Hannan-Quinn criter.	-7.120892
F-statistic	18.06995	Durbin-Watson stat	2.174223
Prob(F-statistic)	0.000000		

The dependent variable for Model D, on the other hand, is clearly non-stationary.

5.2.2 Explanatory variable

The results of the ADF stationarity tests (either with intercept only or with both trend and intercept) performed on the vacancy rate (denoted by X for notational simplicity) indicate clearly that the series is non-stationary. However the first-difference of the series is stationary (at the 99 percent significance level) as indicated by the ADF results (for the two versions of the test) reported below.

Table 5.7: ADF Stationarity Test (intercept only) for vacancy rate

Null Hypothesis: D(X) has a unit root		
Exogenous: Constant		
Lag Length: 1 (Automatic - based on SIC, maxlag=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.367320	0.0006
Test critical values:	1% level	-3.491345
	5% level	-2.888157
	10% level	-2.581041

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(X,2)
 Method: Least Squares
 Date: 08/27/14 Time: 18:11
 Sample (adjusted): 2005M04 2014M04
 Included observations: 109 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-0.437219	0.100112	-4.367320	0.0000
D(X(-1),2)	-0.137535	0.097760	-1.406862	0.1624
C	-0.004574	0.003608	-1.267743	0.2077
R-squared	0.262003	Mean dependent var		0.000896
Adjusted R-squared	0.248079	S.D. dependent var		0.040506
S.E. of regression	0.035124	Akaike info criterion		-3.832732
Sum squared resid	0.130771	Schwarz criterion		-3.758658
Log likelihood	211.8839	Hannan-Quinn criter.		-3.802692
F-statistic	18.81604	Durbin-Watson stat		1.994032
Prob(F-statistic)	0.000000			

Table 5.8: ADF Stationarity Test (intercept only) for vacancy rate

Null Hypothesis: D(X) has a unit root		
Exogenous: Constant, Linear Trend		
Lag Length: 1 (Automatic - based on SIC, maxlag=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.939885	0.0005

Test critical values:	1% level	-4.044415
	5% level	-3.451568
	10% level	-3.151211

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(X,2)

Method: Least Squares

Date: 08/27/14 Time: 18:14

Sample (adjusted): 2005M04 2014M04

Included observations: 109 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	-0.525967	0.106474	-4.939885	0.0000
D(X(-1),2)	-0.095787	0.097964	-0.977777	0.3304
C	-0.019859	0.007857	-2.527703	0.0130
@TREND("2005M01")	0.000248	0.000114	2.180186	0.0315
R-squared	0.293965	Mean dependent var		0.000896
Adjusted R-squared	0.273792	S.D. dependent var		0.040506
S.E. of regression	0.034518	Akaike info criterion		-3.858657
Sum squared resid	0.125108	Schwarz criterion		-3.759892
Log likelihood	214.2968	Hannan-Quinn criter.		-3.818604
F-statistic	14.57258	Durbin-Watson stat		1.987533
Prob(F-statistic)	0.000000			