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The Impact of Automatic Enrolment on the Mental Health Gap in Pension Participation: Evidence from the UK

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The impact of automatic enrolment on the mental health gap in pension participation: evidence from the UK*

ABSTRACT:

A large body of evidence shows that individuals with poor mental health have lower income over the lifespan but a dearth of evidence exists on how poor mental health affects savings behaviour. In this paper, we provide novel evidence of a mental health gap in pension participation in the UK using nationally representative longitudinal data from Understanding Society (UKHLS). Beginning in 2012, the UK government introduced automatic enrolment enabling us to assess the impact of one of the largest pension policy reforms in the world on this mental health gap. We measure mental health using the General Health Questionnaire (GHQ-12) which is a commonly used tool for measuring psychological distress. Prior to automatic enrolment, we find that male private sector employees with poor mental health are 3.2 percentage points less likely to participate in a workplace pension scheme while female private sector employees with poor mental health are 2.6 percentage points less likely to participate in a workplace pension scheme after controlling for key observables including age, education, race, marital status, number of children, occupation type, industry type, presence of a physical health condition and cognitive ability. The implementation of automatic enrolment completely removes the mental health gap in pension participation. By documenting the impact of automatic enrolment on the mental health gap in pension participation, we provide additional support for automatic enrolment policies which have already been shown to reduce gaps in pension participation among female and low income employees.

Keywords: Mental health; psychological distress; pensions; savings; automatic enrolment; financial security; longitudinal studies

JEL Codes: J32, D91, G41

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1. Introduction

In the UK, 1 out of 6 people have at least one common mental health condition (IMHE 2018).¹ These conditions are often accompanied by high levels of emotional distress that can interfere with the ability to participate effectively in daily activities. Despite being less disabling than major psychiatric conditions (e.g. schizophrenia, bipolar disorder)², the higher prevalence of common mental health conditions entails significant economic costs (e.g. Bloom et al. 2012; McManus et al. 2016; Knapp and Wong 2020). These costs include direct health care costs as well as indirect costs incurred in the labour market due to higher unemployment and lower productivity among workers with poor mental health (OECD 2018). There is also significant evidence that poor mental health leads to a range of adverse economic outcomes. For example, individuals with poor mental health are more likely to have lower educational attainment, fewer employment opportunities and lower earnings (Cornaglia, Crivellaro, and McNally 2015; Egan, Daly, and Delaney 2015; 2016; Mousteri et al. 2019; Smith and Smith 2010). These effects tend to be large and persistent over the lifespan (e.g. Goodman, Joyce, and Smith 2011). Further, these economic costs are exacerbated by the particular pervasiveness of such mental health conditions among the working population. Mental health problems account for the largest share of a single illness (40 per cent) and half of all disabilities among people of working age under 65 in the UK (Layard 2013).

In this paper we investigate the effect of poor mental health on the decision to participate in a pension scheme to save for retirement, one of the most important decisions a person makes in their life course. Three main behavioural barriers to pension participation include cognitive burden, procrastination and self-control failures (Thaler and Benartzi 2004). Evidence shows that individuals with common mental health conditions such as anxiety and depression are more likely to experience cognitive burden due to poorer executive functioning and increased memory deficits (e.g. Bishop 2007; Lee et al. 2012; Fossati et al. 2004). Several studies have also found that these individuals tend to focus on smaller immediate rewards as opposed to larger later rewards (present bias) which may elevate their risk of procrastinating on decisions and experiencing more self-control failures (Pulcu et al. 2014; Zhao et al. 2015; Xia et al. 2017). As behavioural barriers to saving for retirement are more pronounced among those with poor mental health,

¹ Common mental health disorders include depression, generalized anxiety disorder (GAD), panic disorder, phobias, social anxiety disorder, obsessive-compulsive disorder (OCD) and post-traumatic stress disorder.

² An example of major psychiatric disorders are bipolar disorders and psychotic disorders such as schizophrenia.

we hypothesize that individuals with poor mental health are less likely to participate in a workplace pension scheme. The mental health gap in pension participation may also be affected by the selection of individuals with poor mental health into occupations or firms who may be less likely to provide access to a workplace pension scheme.

By employing a nationally representative panel dataset, we provide novel evidence of a mental health gap in pension participation that are robust to key predictors of pension participation among both male and female private sector employees in the UK. We also exploit one of the largest pension policy reforms in the world to assess how this mental health gap changes in response to automatic pension enrolment. We find that the mental health disparity in pension participation disappears among both male and female employees in the private sector after the implementation of automatic enrolment. Our findings contribute to the mental health and economics literature by documenting an important economic outcome that is affected by poor mental health. The lower probability of individuals with poor mental health participating in a workplace pension scheme has potentially deleterious effects on the financial security of these individuals and their families when they retire. Importantly, we show that in addition to reducing the pension participation gap among female and low income employees in particular, automatic enrolment in the UK also closed the pension participation gap between employees with and without poor mental health.

The rest of the paper is organized as follows. Section 2 discusses how poor mental health might affect pension participation decisions, the potential role of automatic enrolment in encouraging pension participation among employees with poor mental health and provides details of the automatic enrolment policy introduced in the UK in 2012. Section 3 outlines details of the data used in the study and provides information on main measures used in the analysis. Section 4 outlines the econometric methodology used and reports the main results and robustness checks. Section 5 concludes.

2. Theoretical background and literature

2.1. Poor mental health and the decision to participate in a workplace pension scheme

Three of the main behavioural factors that affect the decision to participate in a pension plan are cognitive overload, self-control failures and procrastination (Thaler and Benartzi 2004). The decision to participate in a workplace pension scheme is highly complex with individuals having to spend a considerable amount of time researching different options and deciding on the specific savings rate if

they choose their own pension plan. Individuals may not possess sufficient financial knowledge or experience to make these decisions appropriately. They may also lack the time to do the required research. Further, signing up for a workplace pension scheme requires self-control in that individuals have to forgo consumption now for benefits in the future. Individuals may be less likely to sign up for a pension plan now if they perceive that the future benefits of pension income are not sufficient to offset the losses incurred in the present. Losses could stem from reductions in current consumption as well as high transaction costs incurred from researching possible pension plans and signing-up for a plan. Given the complexity of the task and willpower required to commit to a pension plan, individuals may keep delaying the decision to participate in a workplace pension scheme. In the next few paragraphs, we discuss why cognitive overload, self-control failures and procrastination are likely to be more pronounced among people with poor mental health. We focus specifically on the evidence for depressive³ and anxiety⁴ disorders which are the most commonly experienced mental health issues in the UK (IMHE 2018).

Cognitive burden

Individuals experiencing mental health conditions face greater cognitive difficulties through impaired concentration, memory, psychomotor speed, visual learning and executive functioning (Lee et al. 2012; Bishop 2007). Depressive symptoms, for example, may affect cognition via reduced interest or pleasure in usual activities, sleep disturbances, reduced energy, and difficulty concentrating or making decisions (Eisenberg, Golberstein, and Hunt 2009). These symptoms are likely to affect the ability of these individuals to process complex information.

³ Depressive disorders include disruptive mood dysregulation disorder, major depressive disorder (including major depressive episode), persistent depressive disorder (dysthymia), premenstrual dysphoric disorder, substance/medication-induced depressive disorder, depressive disorder due to another medical condition, other specific disorder and unspecified depressive disorder. The common feature of all these disorders is the presence of sad, empty or irritable mood, accompanied by somatic and cognitive changes that significantly affect the individual's capacity to function (American Psychiatric Association 2013).

⁴ Anxiety disorders include disorders that share features of excessive fear and anxiety and related behavioural disturbances. Fear is the emotional response to real or perceived imminent threat whereas anxiety is anticipation of future threat. These two states overlap with fear more often associated with surges of autonomic arousal necessary for fight or flight, thoughts of immediate danger, and escape behaviour and anxiety more often associated with muscle tension and vigilance in preparation for future danger and cautious or avoidant behaviours. Anxiety disorders differ from one another in the types of objects or situations that induce fear, anxiety or avoidance behaviour and the associated cognitive ideation (American Psychiatric Association 2013).

Anxiety disorders, on the other hand, are characterized by excessive worrying. At lower levels, anxiety may be productive but at higher levels, it often impairs concentration and the ability to remain on task. Anxiety also shares many symptoms of depression such as reduced energy, sleep disturbances and poor concentration (Eisenberg, Golberstein, and Hunt 2009) which may lower cognitive capacities. These cognitive difficulties are worse among individuals who have experienced psychological distress over longer periods of time or more frequent episodes of psychological distress (e.g. Fossati et al. 2004). The greater cognitive burden experienced by people with poor mental health will likely make it harder for them to navigate the complex problem of selecting a suitable pension plan and choosing their savings rate in the absence of a default process.

Present bias and procrastination

There is evidence in both psychology and economics that individuals with poor mental health are more present-biased. Discounting rates for future rewards among depressed individuals are higher and tends to increase with the severity of depression (Pulcu et al. 2014; Bayer et al. 2019). As for anxiety, studies have shown that high state and trait anxiety⁵ are also associated with higher rates of future discounting (Rounds, Beck, and Grant 2007; Zhao et al. 2015; Xia et al. 2017). The association of anxiety and depression with acute emotional distress and feelings of hopelessness for the future may influence temporal decision-making. Discounting rates for future rewards among individuals with major depressive disorder, for instance, are correlated with the severity of hopelessness experienced (Pulcu et al. 2014). Anxiety, on the other hand, is characterized by an intolerance of uncertainty which results in excessive worrying (Bishop 2007). Individuals with anxiety may then choose smaller immediate options because future outcomes appear very uncertain (Xia et al. 2017). Pessimism and uncertainty about future events might further influence how individuals perceive benefits far into the future for actions taken in the present. If the future seems bleak, smaller rewards in the present may seem more attractive.

A strand of literature in economics that provides further support to how poor mental health can affect the evaluation of risk and rewards over time is that on the effect of emotions on decision-making. Lab experiments find that induced affective states lead to decisions that are different when made in the opposite or neutral affective states. For example, inducing mild positive affect in experimental settings has been shown to significantly reduce time discounting (Ifcher and

⁵ Trait anxiety is defined as an individual's predisposition to respond, and state anxiety is defined as a transitory emotion characterized by physiological arousal and consciously perceived feelings of apprehension, dread, and tension (Spielberger 1966).

Zarghamee 2011) while inducing sadness leads participants to focus on present smaller rewards (Lerner, Li, and Weber 2013). Positive affect may impact time preferences by broadening focus and attention, promoting openness to information and enabling improved integration of information which contribute to greater cognitive flexibility (Pyone and Isen 2011). This improvement in cognitive flexibility then encourages a more thorough evaluation of long-term rewards. Positive affect can also operate by increasing motivation among individuals so that they are willing to wait for delayed rewards (Erez and Isen 2002). These effects of emotions on decisions may be useful in understanding how poor mental health affects economic decisions as strong and prolonged negative affect is a crucial feature of poor mental health.

The greater tendency for present bias among individuals with poor mental health can lead to more procrastination and self-control failures which will further increase their propensity to delay the decision to participate in a workplace pension scheme. Another mechanism that could influence the decision to participate in a workplace pension scheme is possible selection into occupations and firms. Individuals with poor mental health may be more likely to self-select into specific types of jobs, companies and industries that are less likely to have access to a workplace pension scheme. Given that these individuals are more likely to have lower educational attainment, they may be more likely to work in low skilled occupations. These individuals are also more likely to experience unemployment (e.g. Egan, Daly, and Delaney 2015; Mousteri et al. 2019; Butterworth et al. 2012) potentially due to lower educational attainment (e.g. Cornaglia, Crivellaro, and McNally 2015), hiring discrimination (e.g. Ameri et al. 2018), difficulties in the job search process (e.g. Crossley and Stanton 2005) and increased absenteeism and presenteeism in the workplace (e.g. Bubonya, Cobb-Clark, and Wooden 2017). The higher likelihood of experiencing unemployment may reduce their chances of participating in a workplace pension scheme as they are simply spending less time in employment or accepting jobs with employers that are less likely to provide access to workplace pension schemes.

Studying the effect of poor mental health on pension participation in the UK is particularly interesting as we can document the effect of automatic enrolment on this relationship. Compared to other automatic enrolment policies that have been introduced in other countries such as the US, New Zealand and Chile, automatic enrolment in the UK was implemented nationwide, forbade any opt-out by employers and was not implemented together with any other policy changes that would have also encouraged participation in workplace pension schemes. Since automatic enrolment simplifies the decision making process and minimizes the influence of the behavioural factors discussed above, we hypothesize that it will

reduce the gap in pension participation among employees with and without poor mental health who qualify for automatic enrolment. The heightened presence of cognitive burden and present bias among individuals with poor mental health may also discourage opt-out among these individuals.

2.2. Automatic enrolment in the UK

Automatic enrolment in a workplace pension scheme was legislated in the Pensions Act 2008 due to concerns of falling pension savings by employees in the UK's private sector. The legislation requires employers to automatically enrol employees who meet the eligibility criteria into a workplace pension scheme with at least a minimum level of employee and employer contributions as stipulated by the government. The Pensions Regulator was established as part of the Department for Work and Pensions (DWP) to ensure that employers are aware of and comply with their enrolment obligations. Compliance monitoring was high, with strict fines being imposed on employers who failed to enrol employees by the assigned timelines. Employees are eligible for automatic enrolment if they are between 21 years and the state pension age, earn above an earnings threshold and normally work in the UK under a contract of employment.

Up to and including March 2018, the minimum total contribution level started at 2 per cent (at least 1 per cent contributed by the employer) of qualifying earnings. This level increased to 5 per cent (at least 2 per cent contributed the employer) in April 2018 and 8 per cent (at least 3 per cent contributed by the employer) in April 2019. Employers can choose to automatically enrol their employees into pension schemes with higher contribution rates. However, they are not permitted to set the employee contribution rates too high as to encourage employees to opt out. The earnings threshold is set at £10,000 per annum. The earnings threshold is prorated so that actual earnings threshold amounts will differ if employees are paid monthly, 4 weekly, fortnightly or weekly. For example, an employee will meet the earnings threshold if monthly and weekly earnings reach at least £833 and £192 respectively.

The implementation of the policy began in October 2012 and was carried out over a period of five-and-a-half years. The staging dates for employers were allocated based on the number of employees the firm employed in April 2012 as captured by the number of employees on its Pay-As-You-Earn (PAYE) scheme. Automatic enrolment started with companies who employed 250 and more employees. These employers enrolled employees between October 2012 and February 2014. Companies who employed 50 to 249 employees enrolled their employees between April 2014 and April 2015. Employers with 30 to 49 employees enrolled their employees between August 2015 and October 2015. Employers with 30 or

fewer employees began automatic enrolment between January 2016 and April 2017. A test tranche for employers with less than 30 employees were also conducted from January 2016 to April 2017. Employers who took on their first employees between 2012 and 2017 were required to complete automatic enrolment by February 2018. Employers could postpone automatic enrolment up to three months from the assigned staging date and enrol their employees earlier but had to inform The Pensions Regulator in advance. Employees can opt out of their employer pension scheme at any point by completing an opt-out form which will be provided by and should be returned to the employer. Employees would receive a full refund of their contributions if they opt out within one month of being automatically enrolled by the employer. However, if they opt out later, their contributions will remain invested in the pension fund which they can access upon retirement. Employers are required to re-enrol eligible employees who have opted out of the pension scheme 3 years after the employer's staging date. Employers are also required to inform their employees in advance before re-enrolling them into a pension scheme.

In addition to the *eligible* group of employees who are automatically enrolled, the *non-eligible* and *entitled* group of employees can choose to opt in to a workplace pension scheme. The non-eligible group consists of employees who are aged between 16 and 21 years or over the state pension age but earns at least £10,000 per annum or who are aged between 21 years and the state pension age and earns between £5,824 and £10,000 per annum. If they choose to opt into a pension scheme, the employer has to make a minimum contribution. The entitled group consists of employees who earn below £5,824 per annum. The employer does not have to make a minimum contribution if this group chooses to opt into the pension scheme.

As of April 2019, 10 million workers have been automatically enrolled into a workplace scheme (DWP 2019). 84 per cent of eligible employees were participating in a workplace pension with an opt-out rate of nine per cent at the end of 2017. This opt-out rate is driven by older employees (DWP 2018). Using employer provided data up to April 2015, (Emmerson and Cribb 2016) find that automatic enrolment resulted in a 37 percentage point increase in the probability of participating in a workplace pensions among eligible private sector employees. The largest effects on pension participation were observed for employees in their 20s, in lower paid jobs and those who have joined their employer more recently. These employees had the lowest pension participation before automatic enrolment. Large gains were also recorded for female employees with automatic enrolment closing the gender gap in pension participation (DWP 2018).

In terms of pension savings, (Emmerson and Cribb 2016) document increases in the total workplace contribution rate by 1.05 percentage points compared with a pre-reform average of 7.0 percentage points. This increase is driven by a large fraction of employers who automatically enrolled their employees into schemes with employer contributions that were above the required minimum contributions. The proportion of employees receiving between 0 per cent and 1 per cent of employer contributions increased by 21 percentage points while the proportion receiving more than 2 per cent rose by 11 percentage points. A key concern prior to the implementation of the policy and during the early roll-out period was the possibility that employers might engage in some form of levelling down by reducing contribution rates to offset the costs of automatic enrolment. Current evidence suggests very minimal to no levelling down by employers (Emmerson and Cribb 2016; Department for Work and Pensions 2018). Indeed, it appears that employers are also enrolling employees in the non-eligible and entitled group who are also experiencing an increase in pension participation albeit at a smaller rate than the eligible group (Emmerson and Cribb 2016).

Since automatic enrolment simplifies the decision making process and minimizes the influence of the behavioural factors discussed in Section 2.1, we hypothesize that it will reduce the gap in pension participation among employees with and without poor mental health who qualify for automatic enrolment. It is possible that these same behavioural factors will also discourage opt-out more so among individuals with poor mental health. Although this is an important aspect to investigate, we do not observe objective information on opt-out behaviour in our dataset. The eligibility for automatic enrolment was determined based on an income threshold for the working age population (21 to 65 years old). It has been documented in a number of studies that individuals with poor mental health earn less than individuals without poor mental health (e.g. Smith and Smith 2010), therefore, we also investigate whether individuals with poor mental health are less likely to meet the income threshold of £10,000 per annum.

3. Data and Empirical Strategy

3.1. Description of the data

Participants

We use data from the United Kingdom Household Longitudinal Study (UKHLS) also known as Understanding Society (University Of Essex 2020) which collects high quality longitudinal information on socioeconomic characteristics, health behaviours and attitudes, primarily from individuals aged 16 and over. It is a survey of respondents from approximately 40,000 households from across the UK (England, Scotland, Wales and Northern Ireland). One of the largest surveys of its kind, the UKHLS panel is representative of the UK population and has been designed to ensure ethnic minorities are adequately represented. The UKHLS sample is made up of three main components: a general population sample which consists of about 28,000 households, a continuation of the former British Household Panel Survey sample which consist of about 6,400 households and an ethnic minority boost sample which consists of about 4,200 minority households. Beginning in 2009 to 2010 (Wave 1), households have been visited every year to capture changes in circumstances over time. Interviews are carried out face-to-face in respondents' homes by trained interviewers or through a self-completion online survey. Young people aged 10-15 complete a youth questionnaire, whilst respondents aged 16 and over complete the adult questionnaire. Everyone in the household is surveyed and transitions out of the household and into the household are tracked.⁶

⁶ All household members of the households chosen in Wave 1 form the core sample. They are referred to as Original Sample Members (OSM). The children of OSM mothers also become OSMs. This is the core sample, that is, they represent the population of interest. So, OSMs are followed wherever they go as long as they live in the UK. If anyone joins the household of one or more OSMs, then they are called Temporary Sample Members (TSMs) and are interviewed only as long as they live with at least one OSM.

Key Measures

Dependent variable: Participation in a workplace pension scheme

Respondents are asked whether their employer runs a pension scheme if they are currently employed and subsequently whether they belong to their employer's pension scheme.⁷ This question is asked in Wave 1 (2009 to 2010), Wave 2 (2010 to 2011), Wave 4 (2012 to 2013), Wave 6 (2014 to 2015) and Wave 8 (2016 to 2017). We therefore do not include Waves 3, 5 and 7 in the analyses. The absence of this question in Wave 3, 5 and 7 is not a significant issue as we are still able to sufficiently capture pension participation before and after automatic enrolment. This question is asked specifically to individuals whose present employer provides a pension scheme or superannuation scheme for which they are eligible.⁸ If respondents answer that their present employer does not provide a pension scheme or superannuation scheme for which they are eligible, we assume that they are not at that moment participating in a workplace pension scheme provided that they are currently employed in the private sector. We also capture those who answer "don't know" to this question as not participating given that they are also employed in the private sector. This treatment of responses will more accurately capture the impact of automatic enrolment since the goal of automatic enrolment was to make it mandatory for employers to provide a workplace pension scheme for their employees and to develop pension schemes where they were not previously available. We also provide descriptive information to assess how likely it is that individuals with poor mental health work for employers who provide a pension scheme for which they are eligible prior to the implementation of automatic enrolment.

Independent variable of interest: Psychological distress as captured by the General Health Questionnaire-12 (GHQ-12)

Respondents completed the 12-item version of the GHQ⁹, used to detect psychiatric cases in the general population by comparing the respondent's current state with their usual state, in every wave of the survey. The GHQ-12 is a short yet well validated scale often used as a screening tool for assessing psychological distress. The score is highly correlated with standardised clinical interviews assessing the presence of a clinical mental health condition. In a review of six

⁷ There is no overall measure of pension participation including participation in a private pension. Although there is a measure of private pension participation, it is only captured for those aged 45 and older.

⁸ This question was asked to respondents who were currently employed whether in the public or private sector.

⁹ The specific questions asked on the GHQ-12 are available in the Appendix.

validity studies of the GHQ-12, Goldberg and Williams (1988) reported sensitivity rates (proportion of cases correctly identified) of between 71 per cent and 91 per cent. Due to its brevity and effectiveness, the GHQ-12 is widely used in clinical practice, epidemiological research and psychological research (e.g. Goldberg et al. 1997; Thomas, Benzeval, and Stansfeld 2005; Sweeting, Young, and West 2009). It is also commonly used in economics research as a measure of mental health (e.g. Cornaglia, Crivellaro, and McNally 2015; Egan, Daly, and Delaney 2015; 2016) and individual well-being (e.g. Clark, Georgellis, and Sanfey 2001; Gardner and Oswald 2007).

In the GHQ-12, respondents are asked to rate questions about their general happiness, confidence, ability to face problems, overcome difficulties, make decisions and enjoy normal day to day activities using a 4-item scale (where 1 = more so than usual, 2 = about the same as usual, 3 = less so than usual and 4 = much less than usual). These measures are then converted to a single scale by recoding 1 and 2 values on individual variables to 0, and 3 and 4 values to 1, and then summing, giving a scale running from 0 (the least distressed) to 12 (the most distressed). The converted score is provided by UKHLS. In line with accepted convention (Goldberg et al. 1997), respondents with a score of 3 or more are termed as achieving “psychiatric caseness” which means that they are likely to present with psychiatric disorder. For the main specifications, we capture poor mental health as responses scoring 3 and above on this 0 to 12 point scale.

3.2. Empirical Strategy

We estimate linear probability models for respondents employed in the private sector with a host of individual controls to estimate the association between baseline psychological distress captured in Wave 1 (2009 and 2010) on pension participation in a workplace scheme before and after automatic enrolment. Baseline psychological distress is used to obtain a measure of mental health that is uncontaminated by any effects that the policy which was implemented in 2012 may have had on mental health. The stability of GHQ-12 scores across waves in UKHLS avoids the issue of having particularly high GHQ-12 scores in Wave 1 (2009 and 2010). Psychological distress is a binary variable equalling 1 if individuals score 3 and above on the GHQ-12 scale and 0 if they score below 3. The individual controls included are age, education, race, marital status, income, number of children, occupation type, industry classification, presence of at least one physical health condition and cognitive ability. These controls are included on a wave basis as opposed to a baseline level. Occupation type are categorized as professional, managerial or technical, skilled non-manual, skilled manual, partly skilled and unskilled. All the control variables with the exception of physical health conditions

and cognitive ability are available in each wave of the dataset. Physical health conditions were first asked in Wave 1 and then only to new entrants in Wave 3 onwards so there is no data collected for this variable in Wave 2. To address the issue of missing values, we impute the values for Wave 2 based on Wave 1 and 3. Cognitive ability is captured using several variables measuring word recall, delayed word recall, basic math skills and verbal fluency. As these variables were only collected in Wave 3, we apply the responses in Wave 3 across the other waves of the data due to the stability of cognitive ability in adulthood (e.g. Friedman et al. 2016). We further use the sample mean value of these variables to impute any missing values in Wave 3. In our analyses, we also limit the sample to the working age population (those aged 22 to 65) who are currently employed. Our sample includes both part time and full time employees since automatic enrolment applied to both groups.

Main specifications:-

(1) Pre policy model:

$$y_{i(wave\ 1-2)} = \alpha_i + \beta(MH_i)_{wave\ 1} + \delta X_{it} + \varepsilon_{it}$$

(2) Post policy model:

$$y_{i(wave\ 4-8)} = \alpha_i + \beta(MH_i)_{wave\ 1} + \delta X_{it} + \varepsilon_{it}$$

To assess the effect of automatic enrolment on the pension participation rates of employees with and without poor mental health, these models are estimated separately for pre and post policy periods using the baseline psychological distress measure. Pre policy periods cover Wave 1 (2009-2010) and Wave 2 (2010-2011) while post policy periods cover Wave 4 onwards (2012 to 2017). We omit Wave 3 (2011-2012) data in the pre and post specifications as the pension participation question was not asked in this wave. We do not use contemporaneous measures of psychological distress in our main specifications as it is possible that automatic enrolment had an effect on mental health so the use of contemporaneous measures may introduce endogeneity. Secondly, estimations using contemporaneous measures imply that year on year changes in mental health are associated with year on year changes in pension participation which is misleading. It is more realistic to think of mental health as an initial condition that affects

pension participation over a period of time as opposed to having sharp yearly effects on pension participation decisions that are relatively inert (e.g. Thaler and Benartzi 2004) over the life course.

Standard errors are clustered at the individual level in the pooled OLS specifications. The use of a standard fixed effects estimator in these specifications is not feasible as baseline psychological distress is only captured in one wave. Hence, baseline psychological distress will be considered a time-invariant characteristic under the standard fixed effects estimator so that the coefficient of interest cannot be estimated. To obtain the estimate on the mental health measure, the Mundlak estimator¹⁰ (Mundlak 1978) is used to account for the effect of time invariant characteristics. The pooled OLS and Mundlak estimates are presented together in the main regression results. All analyses are conducted separately for males and females due to the large gender differences in pension participation and mental health. To better understand the role of the control variables in explaining the association between baseline psychological distress and pension participation in an employer's scheme, we also estimate decompositions based on the standard Oaxaca-Blinder method (Oaxaca 1973; Blinder 1973) and Gelbach approach (Gelbach 2016).

4. Results

4.1. Descriptive Analysis

Figure 1 shows the pension participation rates among public sector and private sector employees in the UK using UKHLS data. These trends are consistent with pension participation trends reported by The Department for Work and Pensions.¹¹ Although the pension participation rates of employees in the public sector have been historically high, there is a slight increase in pension participation in the public sector after the introduction of automatic enrolment in 2012. There is a major increase in the pension participation rates of employees who were eligible for automatic enrolment in the private sector from about 65 per cent to

¹⁰ The procedure for implementing the Mundlak estimator is as follows:

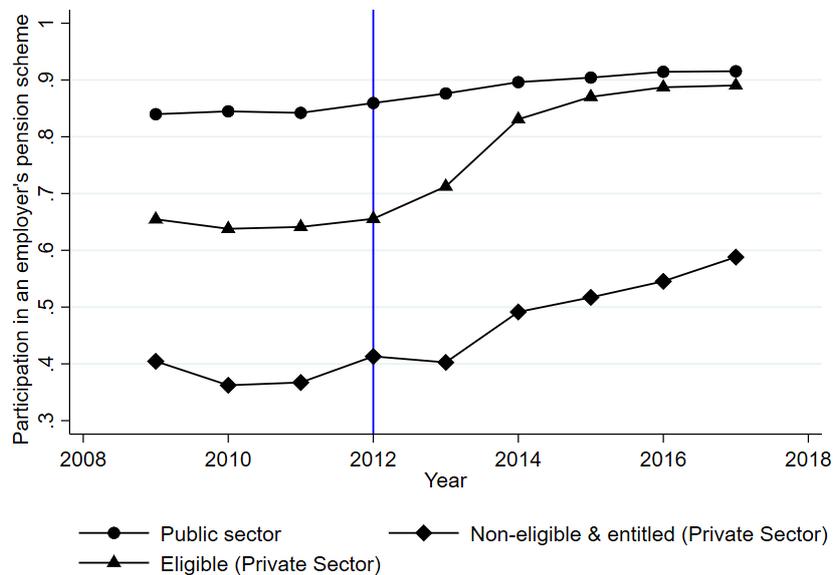
- The mean for each independent time varying variable is calculated within each cluster.
- The mean for the cluster is subtracted from each time-varying variable. The deviations from the cluster mean will represent the within cluster variability
- A random effects model that includes both the means of the variables and the difference from the means of the variables are estimated

¹¹ Trends in pension participation for 2008 to 2018 by The Department for Work and Pensions can be found here

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/806513/workplace-pension-participation-and-saving-trends-2008-2018.pdf

almost 90 per cent after automatic enrolment was implemented. There is also a significant increase in the pension participation rates of employees in the private sector who were not eligible for automatic enrolment but could opt into the scheme. This trend is consistent with results from Crib and Emerson (2016) who also find increases in pension participation for employees who were not eligible for automatic enrolment but could opt in using employer reported data from the Annual Survey of Hours and Earnings. The authors suggest that this increase could be driven by peer effects in the workplace or the initiative of employers who are automatically enrolling their employees who earn less than the set income threshold of £10,000 per annum.

Figure 1: Pension participation rates among public sector and private sector (eligible and non-eligible) employees in the UK

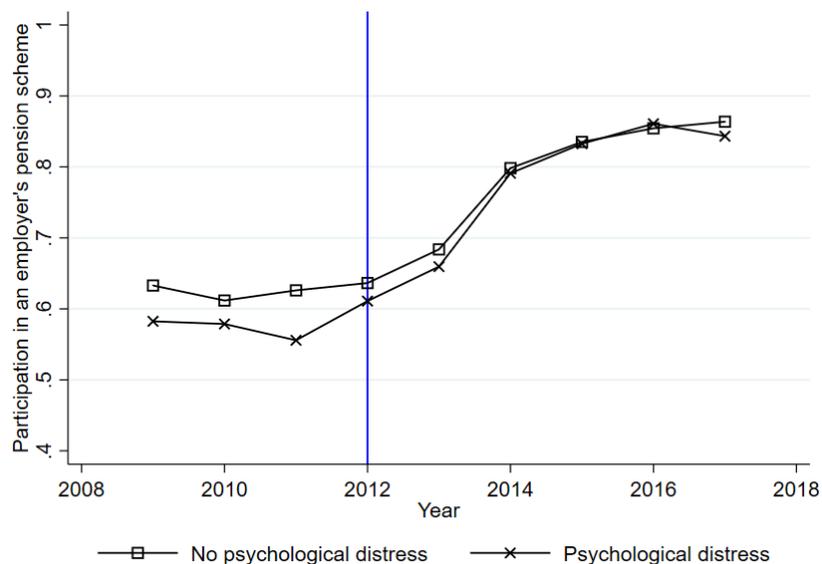


Sample: Private and public sector employees aged 22 to 65 years old

Since the interviews for one wave in UKHLS is conducted over a period of 2 years, we have yearly estimates of the pension participation variable in every year. A raw plot of the data using yearly contemporaneous measures of psychological distress and participation in a workplace pension scheme is provided in Figure 2(a). There exists a 2.7 percentage point difference that is significant at the 0.1 per cent level in pension participation between individuals with and without psychological distress in the private sector across all the years. Before the introduction of automatic enrolment, the difference in pension participation between individuals with and without psychological distress is 4.4 percentage points, also significant at the 0.1 per cent level. Once the policy is introduced in 2012, there is a large

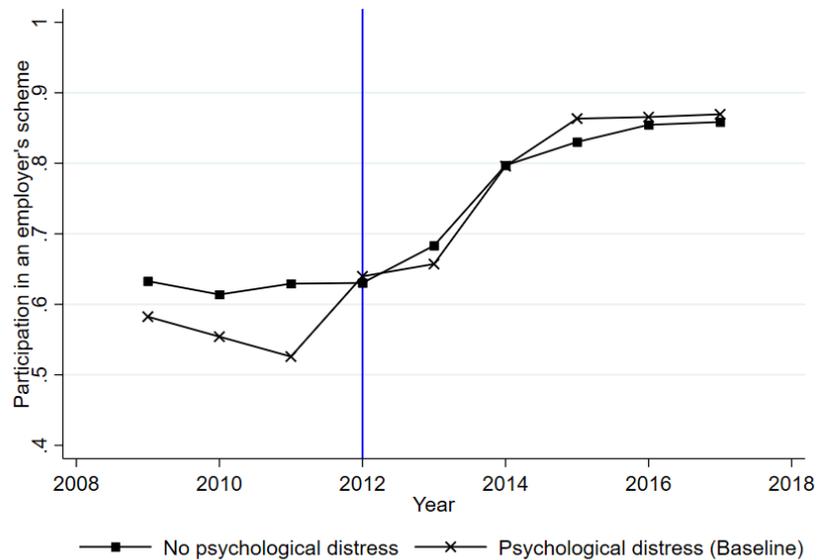
increase in pension participation for both groups with the pension participation rates of these groups converging in 2016. In the post policy periods, the difference in pension participation between individuals with and without psychological distress is 1.4 percentage points which is significant at the 10 per cent level. The same plot replicated using a baseline measure of psychological distress captured in Wave 1 (2009-2010) is provided in Figure 2(b). The trends using contemporaneous and baseline measures of psychological distress are quite similar with a slightly larger difference (6.5 percentage points significant at the 0.1 per cent level) in pension participation rates before the implementation of automatic enrolment when a baseline measure of psychological distress is employed.

Figure 2(a) : Pension participation rates by contemporaneous psychological distress among private sector employees



Sample: Private employees aged 22 to 65 years old. Psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale on a yearly basis.

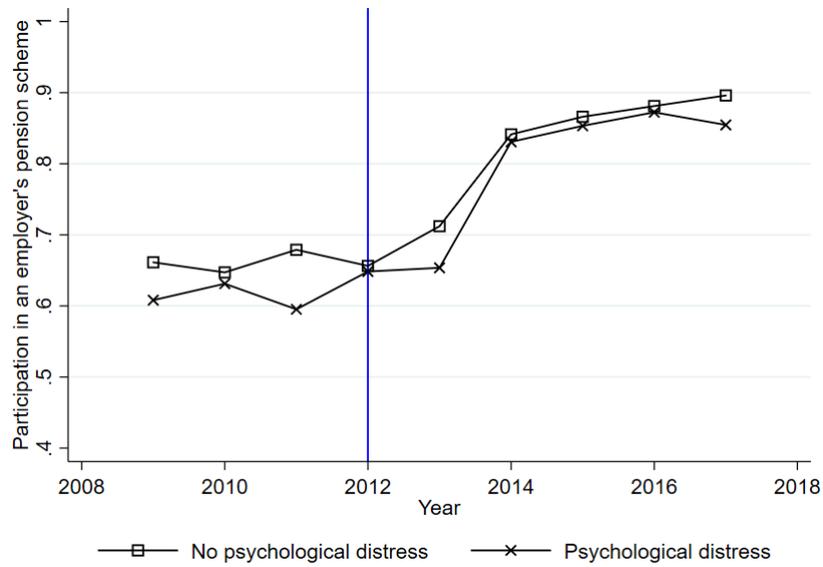
Figure 2(b) : Pension participation rates by baseline psychological distress in Wave 1 (2009-2010) among private sector employees



Sample: Private employees aged 22 to 65 years old. Baseline psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale in Wave 1 (2009-2010).

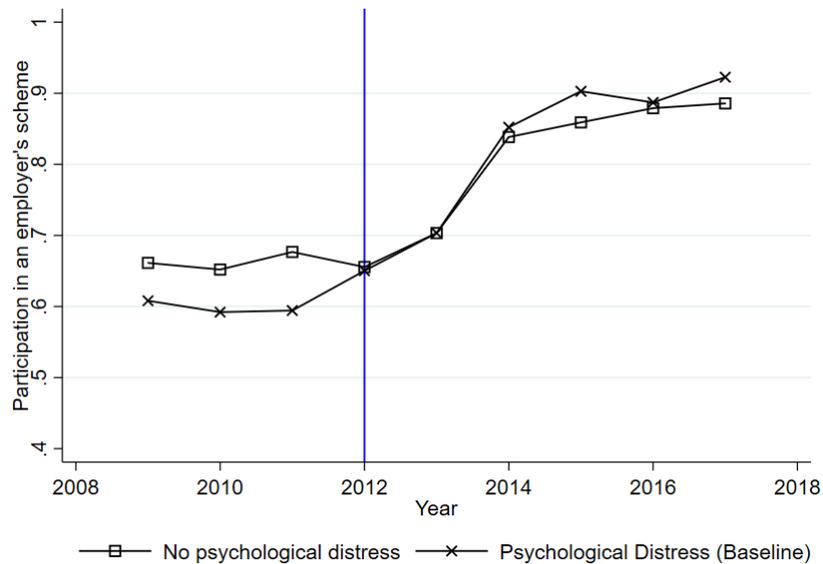
As shown in Figure 3 (a), the mental health gap in pension participation exists for both male and female employees although it is larger for male employees. The gap considerably reduces after the introduction of automatic enrolment for both male and female employees. Prior to the introduction of automatic enrolment, the difference in pension participation between males with and without psychological distress is 3.7 percentage points which is significant at the 5 per cent level. This difference reduces to 2.3 percentage points after automatic enrolment and is significant at the 5 per cent level. Figure 3(b) shows a similar trend when the baseline measure of psychological distress is employed. Prior to the implementation of automatic enrolment, individuals with psychological distress are 6.2 percentage points (significant at the 0.1 per cent level) less likely to participate in an employer's pension scheme.

Figure 3(a) : Pension participation rates by contemporaneous psychological distress for male employees in the private sector



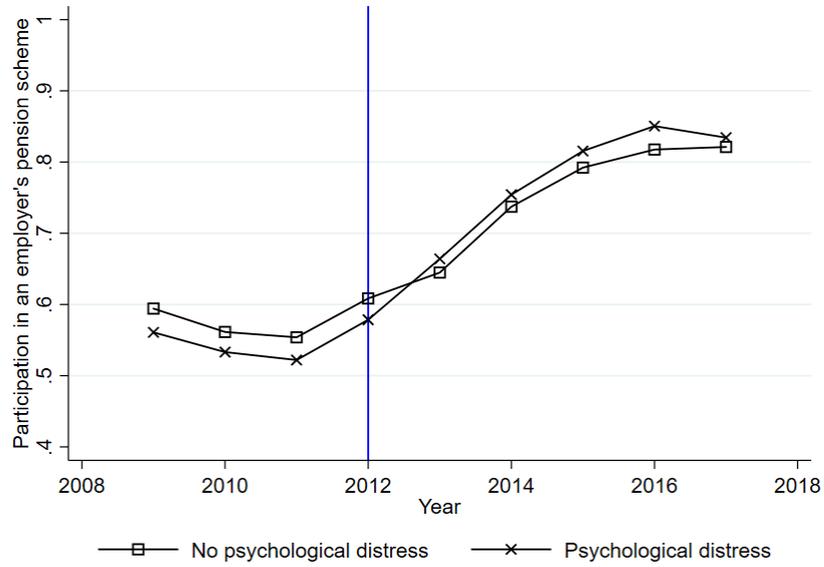
Sample: Male private employees aged 22 to 65 years old. Psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale on a yearly basis.

Figure 3(b) : Pension participation rates by baseline psychological distress in Wave 1 (2009-2010) for male employees in the private sector



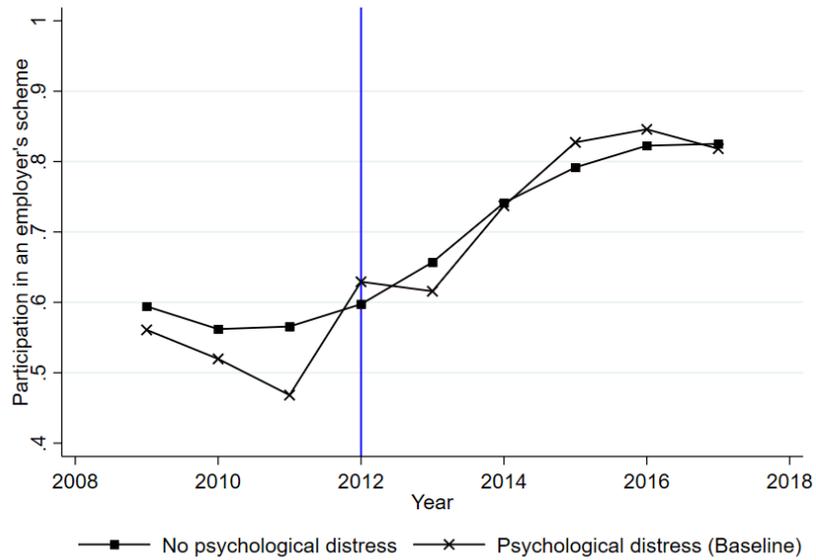
Sample: Male private employees aged 22 to 65 years old. Baseline psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale in Wave 1 (2009-2010).

Figure 4(a) : Pension participation rates by contemporaneous psychological distress for female employees in the private sector



Sample: Female private employees aged 22 to 65 years old. Psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale on a yearly basis.

Figure 4(b) : Pension participation rates by contemporaneous psychological distress for female employees in the private sector



Sample: Female private employees aged 22 to 65 years old. Baseline psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale in Wave 1 (2009-2010).

For female employees in Figure 4(a), the difference in pension participation for those with and without psychological distress is 3.1 percentage points which is significant at the 5 per cent level. This difference is no longer significant after automatic enrolment. Figure 3(b) shows a similar trend when the baseline measure of psychological distress is employed. Prior to the implementation of automatic enrolment, female employees with psychological distress are 5.0 percentage points (significant at the 1 per cent level) less likely to participate in an employer's pension scheme.

Table 1 provides a comparison of individuals with and without psychological distress measured at the baseline level (Wave 1) in the sample of those employed and unemployed between the ages of 22 and 65 inclusive. Consistent with prior studies in psychology and economics, individuals with poor mental health are more likely to be female (63.3 per cent vs. 36.8 per cent), less likely to have higher education qualifications (39.2 per cent vs. 42.1 per cent), more likely to spend time in unemployment (8.1 per cent vs. 5.3 per cent) and long-term sickness or disability absences (10.6 per cent vs. 3.3 per cent), earn on average less per month (£1203.62 vs. £1536.09) and are less likely to be married (49.6 per cent vs. 57.2 per cent). There are no large differences in occupational types and industries between employees with and without psychological distress.¹² Individuals with baseline psychological distress account for about 15 per cent of total observations in the data. This number is consistent with the most recently released statistic of the proportion of people in the UK who have experienced at least one mental health condition which stands at about 17 per cent (IMHE 2018).

¹² The comparison for industry types for individuals with and without psychological distress are available in the Appendix.

Table 1 : A comparison of individuals with and without psychological distress (baseline) by key individual characteristics

	No psychological distress	Psychological distress (GHQ-12 \geq 3)
Mean age	43.6	45
Gender		
Male	44.3%	36.8%
Female	55.8%	63.3%
Race		
White	83.6%	82.8%
Asian	9.7%	9.5%
Black	4.3%	4.6%
Others	2.5%	3.2%
Highest education		
GSCE/O Levels	21.4%	22.0%
A Levels/IB	8.0%	7.9%
Degree/Diploma	42.1%	39.2%
Employment Status		
Paid employment	63.8%	53.9%
Unemployment	5.3%	8.1%
Retired	7.7%	7.7%
Self-employment	9.5%	8.1%
Long term sick or disabled	3.3%	10.6%
Sector		
Public	37.9%	40.8%
Private	62.1%	59.2%
Occupation Type		
Professional	6.6%	6.0%
Managerial and Technical	38.3%	37.9%
Skilled non-manual	20.3%	22.1%
Skilled manual	18.5%	16.6%
Partly skilled	13.1%	13.6%
Unskilled	3.2%	3.8%
Mean monthly income	1536.09	1203.62
Cognitive ability		
Word recall	6.5	6.4
Delayed word recall	5.5	5.4
Basic math	4.1	4.0
Verbal fluency	6.8	6.8
Having at least one physical health condition	13.8%	24.5%
Marital status		
Single	29.3%	29.0%
Married/Civil Partnership	57.2%	49.6%
Separated/Divorced	11.5%	17.8%
Number of observations	183,653	32,948

Sample: All in the data. Baseline psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale in Wave 1 (2009-2010).

In this paper, we focus only on employed individuals in the private sector as this sector was the main target for automatic enrolment. Although individuals with poor mental health earn less than individuals without poor mental health, they are only slightly less likely to meet the threshold of £10,000 per year to qualify for automatic enrolment. Within the private sector, 82.4 per cent of individuals without poor mental health meet the cut-off while 78.3 per cent of individuals with poor mental health do. This difference is significant at the 0.1 per cent level but the majority of individuals with poor mental health who work in the private sector qualify for automatic enrolment. Among male employees, 92.9 per cent of individuals without poor mental health meet the cut off criteria while 90.5 per cent of individuals with poor mental health do. As for female employees, 69.6 per cent without poor mental health meet the cut off criteria while 68.5 per cent with poor mental health do. The differences among male and female employees are both significant at the 0.1 per cent level but the difference is larger among male employees.

As the pension participation in a workplace scheme question is only asked to respondents who mentioned that their present employer provides a pension scheme or superannuation scheme that they are eligible for, it is important to know how likely it is for individuals with poor mental health to work for employers who provide these schemes and whether they are eligible for them. At the overall level in the private sector, 61 per cent of employees without poor mental health work for employers who provide pension schemes while 58.4 per cent of employees with poor mental health do. This difference is significant at the 1 per cent level. For male private sector employees, 64.7 per cent of individuals without poor mental health work with employers who provide these schemes for which they are eligible compared to 61.3 per cent of individuals with poor mental health prior to automatic enrolment. This difference is significant at the 1 per cent level. There is no significant difference for female private sector employees. Although descriptive in nature, these statistics provide some support for the hypothesis that individuals with poor mental health are more likely to self-select into occupations, firms or industries that are less likely to offer a workplace pension scheme prior to automatic enrolment in particular for male employees.

4.2. The relationship between poor mental health and participation in a workplace scheme before and after automatic enrolment

The following results present the associations between baseline psychological distress captured in Wave 1 (2009-2010) and pension participation in a workplace scheme in Wave 1 (2009-2010) and Wave 2 (2010-2011) prior to the implementation of automatic enrolment. Specification 1 shows results from the uncontrolled model and Specification 5 shows results from the fully controlled model. In Table 2(a), male private sector employees with psychological distress are 5.1 percentage points less likely to participate in a workplace pension scheme prior to the implementation of automatic enrolment in the uncontrolled model.¹³

Table 2 (a) : The relationship between baseline psychological distress captured in Wave 1 (2009 and 2010) on pension participation in a workplace scheme prior to automatic enrolment in Wave 1 and 2 (2009 – 2011) among male employees in the private sector

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	-0.051*** (0.016)	-0.036* (0.016)	-0.041* (0.016)	-0.030* (0.015)	-0.032* (0.015)	-0.043** (0.016)
	<i>Mundlak</i>	-0.064*** (0.015)	-0.041** (0.015)	-0.047** (0.016)	-0.033* (0.015)	-0.035* (0.015)	-0.050** (0.015)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		11,777	10,561	10,024	9,770	9,770	10,024
N – Mundlak		8,541	7,332	6,795	6,630	6,630	6,795
R-squared – Pooled OLS		0.001	0.085	0.083	0.219	0.221	0.089

These results are based on the sample of male employees aged 22 to 65 years who are employed in the private sector. The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

¹³ Full regression results are available in Table A2(a) in the Appendix.

In the fully controlled model, male private sector employees with psychological distress are 3.2 percentage points less likely (significant at the 5 per cent level) to participate in a workplace pension scheme prior to the policy. The characteristics that are associated with greater participation in a workplace scheme for male employees in the private sector are being White, being married and being in occupations that are categorized as professional, managerial and technical, skilled non-manual and partly skilled-manual (as opposed to unskilled occupations).

Table 2 (b) : The relationship between baseline psychological distress captured in Wave 1 (2009 and 2010) on pension participation in a workplace scheme prior to automatic enrolment Wave 1 and 2 (2009 – 2011) among female employees in the private sector

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	-0.036** (0.014)	-0.027 (0.014)	-0.025 (0.014)	-0.026* (0.012)	-0.026* (0.012)	-0.026 (0.014)
	<i>Mundlak</i>	-0.041** (0.013)	-0.037** (0.013)	-0.033 (0.014)	-0.027* (0.012)	-0.028* (0.012)	-0.034 (0.014)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		10,640	9,625	9,315	9,125	9,125	9,315
N – Mundlak		7,663	6,649	6,341	6,221	6,221	6,341
R-squared – Pooled OLS		0.001	0.013	0.014	0.025	0.025	0.026

These results are based on the sample of female employees aged 22 to 65 years who are employed in the private sector. The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

In Table 2(b), female private sector employees with psychological distress are 3.6 percentage points less likely to participate in a workplace pension scheme prior to the implementation of automatic enrolment in the uncontrolled model.¹⁴ The coefficient is no longer significant when age, education, race, marital status,

¹⁴ Full regression results are available in Table A2(b) in the Appendix.

number of children and physical health conditions are accounted for. However, the association is significant when income, occupation type and industry are included in the model. In the fully controlled model, female private sector employees with psychological distress are 2.6 percentage points less likely (significant at the 5 per cent level) to participate in a workplace pension scheme prior to automatic enrolment. Characteristics that are associated with greater participation in a workplace pension scheme for female employees are being White, being married and being in occupations that are categorized as professional, managerial and technical and skilled non-manual (as opposed to unskilled occupations).

Tables 3 present the associations in the post policy periods.¹⁵ After automatic enrolment is introduced, the negative association between baseline psychological distress and pension participation in a workplace scheme is no longer significant in any of the specifications for male and female employees with psychological distress. We hypothesized that automatic enrolment would reduce the gap in pension participation between employees with and without poor mental health but automatic enrolment completely closes the mental health gap in pension participation for both males and females in the private sector.

¹⁵ Full regression results are available in Table A3(c) and A3(d) in the Appendix.

Table 3 (a) : The relationship between baseline psychological distress captured in Wave 1 (2009 and 2010) on pension participation in a workplace scheme after automatic enrolment in Wave 4 onwards (2012 – 2017) among male employees in the private sector

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	0.026 (0.016)	0.006 (0.016)	0.006 (0.016)	0.016 (0.015)	0.015 (0.015)	0.005 (0.016)
	<i>Mundlak</i>	0.028 (0.016)	0.020 (0.016)	0.020 (0.016)	0.024 (0.016)	0.022 (0.016)	0.016 (0.016)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		15,356	13,246	13,238	13,075	13,075	13,238
N – Mundlak		8,704	7,609	7,607	7,528	7,528	7,607
R-squared – Pooled OLS		0.000	0.037	0.037	0.129	0.129	0.042

These results are based on the sample of male employees aged 22 to 65 years who are employed in the private sector.

The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

Table 3 (b) : The relationship between baseline psychological distress captured in Wave 1 (2009 and 2010) on pension participation in a workplace scheme after automatic enrolment in Wave 4 onwards (2012 – 2017) among female employees in the private sector

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	0.007 (0.016)	-0.009 (0.016)	-0.010 (0.016)	-0.011 (0.014)	-0.010 (0.016)	-0.010 (0.016)
	<i>Mundlak</i>	-0.002 (0.015)	-0.009 (0.015)	-0.008 (0.016)	-0.012 (0.014)	-0.011 (0.014)	-0.011 (0.015)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		13,640	11,625	11,615	11,467	11,467	11,615
N – Mundlak		7,999	6,896	6,893	6,819	6,819	6,893
R-squared – Pooled OLS		0.000	0.025	0.025	0.176	0.176	0.025

These results are based on the sample of female employees aged 22 to 65 years who are employed in the private sector. The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

4.3. The role of individual characteristics in explaining the association between poor mental health and participation in a workplace pension scheme

In addition to the OLS models above, we estimate Oaxaca-Blinder and Gelbach decompositions before automatic enrolment. The Oaxaca-Blinder method decomposes the changes in the mean into the sum of three components. The first is due to the changes in the levels of the explanatory variables. The second is due to changes in the parameters. The final component captures the interaction between the first two decompositions (Oaxaca 1973; Blinder 1973). The Oaxaca-Blinder approach is typically used in discrimination settings where the second and third factors are considered indirect effects of the explanatory variables that are attributed to discrimination (Neuman and Oaxaca 2004). In the context of our study, the first decomposition results can be interpreted as the contribution of

changes in the level of the observables to the association between baseline psychological distress and pension participation in an employer's scheme. The second and third decomposition results can be thought of as the contribution to the association between psychological distress and pension participation due to the effect of psychological distress on these explanatory variables or potentially due to the contribution of any other observables not captured in the model.

The purpose of progressively adding controls is to show that the relationship between the treatment and dependent variable is not sensitive to observable controls and thus unlikely to be sensitive to unobservable controls, not to attribute variation to certain covariates. Although some information regarding the contribution of each set of variables can be obtained from the sequential addition of these variables to the model, the observed effect of each set of variables is influenced by the order in which they are added (Gelbach 2016). Unlike the Oaxaca-Blinder approach, the Gelbach approach decomposes cross-specification differences in pooled OLS estimates of the psychological distress coefficient but does so in a path dependent manner and enables us to estimate the contribution of groups of specific variables.

The Oaxaca-Blinder and Gelbach decompositions yield similar results. For male employees in the private sector, the level of the endowments contributes to more than half of the association between psychological distress and pension participation. Based on the Gelbach approach, occupation characteristics (income, occupation type and industry type) account for most of this contribution. For female employees, the level of endowments does not matter as much in explaining the association between psychological distress and pension participation as opposed to the direct effect of psychological distress or potentially other unobserved confounding factors.

Table 4(a): Oaxaca-Blinder decomposition results for employees in the private sector before automatic enrolment

	Total	Endowments	Parameters	Interaction
Oaxaca-Blinder				
Male employees	0.051*** (0.013)	0.029*** (0.006)	0.024* (0.012)	-0.002 (0.004)
Female employees	0.035** (0.011)	0.006 (0.005)	0.026** (0.010)	0.002 (0.003)
Gelbach approach				
Male employees	0.051*** (0.014)	0.027*** (0.006)		
Intellectual ability (Education and cognitive ability)		0.002 (0.001)		
Occupation (Income, occupation type and industry)		0.020*** (0.002)		
Other characteristics (Age, race, marital status, number of children, physical health conditions)		0.009*** (0.006)		
Female employees	0.035** (0.012)	0.008 (0.005)		
Intellectual ability (Education and cognitive ability)		-0.001 (0.001)		
Occupation (Income, occupation type and industry)		0.005 (0.005)		
Other characteristics (Age, race, marital status, number of children, physical health conditions)		0.003 (0.005)		

These results are based on the sample of male and female employees aged 22 to 65 years in the private sector. Standard errors are shown in parentheses.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively.

5. Robustness

5.1. How do the results change when a higher threshold is used on the GHQ?

We repeat the pre and post estimations by measuring psychological distress using a cut-off point of 6 on the GHQ-12 which captures more severe psychological distress.¹⁶ Before automatic enrolment, the results show that male employees with more severe psychological distress are 5.9 percentage points (significant at the 5 per cent level) less likely to participate in a workplace pension scheme in the

¹⁶ Results are available in Tables A3 in the Appendix.

model with no controls. This coefficient reduces to 5.0 percentage points (significant at the 5 per cent level) when key predictors of pension participation such as age, race, education, marital status, number of children and presence of a physical health condition are included in the model. The association is no longer significant when income, occupation type and industry type are controlled for. Any negative associations between baseline psychological distress and participation in a workplace pension scheme disappear after the introduction of automatic enrolment. Female employees with more severe psychological distress are 4.6 percentage points less likely to participate in a workplace pension scheme in the model with no controls. This negative association is no longer significant when controls are included in the model and completely disappears post pensions auto-enrolment. The coefficients on psychological distress in the pre policy periods are larger compared to the coefficients obtained when using a cut-off point of 3 on the GHQ-12 for both males and females which is consistent with the idea that individuals with worse psychological distress may have greater cognitive impairment, present bias and a higher likelihood of working in occupations or firms that are less likely to provide workplace pension schemes before automatic enrolment.

5.2. How robust are the pre policy main specification results to omitted variable bias based on the Oster method?

We use the Oster method (Oster 2019) to assess the effect of possible omitted variable bias on the coefficients from the main specifications used to estimate the association of mental health and pension participation in the pre policy periods for private sector male and female employees. The test is performed by calculating bounds for the results based on information on both the coefficient and R-squared movements due to the addition of controls to the regression. Assumptions are made about the coefficient of proportionality δ and the maximum R-squared value of the model if one could control for both observables and unobservables. The coefficient of proportionality δ measures how strongly the unobservable characteristics are correlated with the explanatory variable of interest relative to the unobservable characteristics. Oster argues that it is reasonable to assume that $\delta = 1$ such that unobservables are equally as important as observables in explaining the outcome variable. Setting the maximum R-squared value at 1 means that the outcome can be fully explained by the explanatory variable of interest and controls but this is not always the case due to measurement errors and idiosyncratic variation. Following other papers, we use a range of values for the maximum R-squared value calculated based on the R-squared value of the controlled model to perform the test. The identified set which contains the bias adjusted coefficient

and the coefficient from the fully controlled model excludes 0 (robust to omitted variable bias) at twice the R-squared value of the controlled model for both private sector male and female employees with the assumption of equal selection between on the observables and unobservables.

Males in the private sector prior to the implementation of automatic enrolment

	Rmax = 1, $\delta = 1$	Rmax = 0.29, $\delta = 1$ $\Pi = 1.3 (1.3*0.22)$	Rmax = 0.44, $\delta = 1$ $\Pi = 2.0 (2.0*0.22)$
Identified set	[0.046, -0.032]	[-0.025, -0.032]	[-0.011, -0.032]

Females in the private sector prior to the implementation of automatic enrolment

	Rmax = 1, $\delta = 1$	Rmax = 0.33, $\delta = 1$ $\Pi = 1.3 (1.3*0.25)$	Rmax = 0.50, $\delta = 1$ $\Pi = 2.0 (2.0*0.25)$
Identified set	[0.002, -0.026]	[-0.024, -0.026]	[-0.017, -0.026]

5.3. How do the results change when contemporaneous measures of psychological distress and pension participation are employed?

We repeat the main specifications using contemporaneous measures of psychological distress and pension participation.¹⁷ In this model, males are 3.7 percentage points (significant at the 5 per cent level) less likely to have a pension participation in the same year that they also report psychological distress in the model with no controls. This coefficient reduces to 3.4 percentage points (significant at the 5 per cent level) when key predictors of pension participation such as age, race, education, marital status, number of children and presence of a physical health condition are included in the model. The association is no longer significant when income, occupation type and industry type are controlled for. In the post policy periods, this coefficient reduces to 2.3 percentage points and remains significant at the 5 per cent level. The association disappears when controls are included in the post policy specifications. Female private sector employees are 3.1 percentage points less likely to have a pension participation but this coefficient is not significant at the 5 per cent level. After the implementation of automatic enrolment, the coefficients are positive and not significant at the 5 per cent level.

¹⁷ Results are available in Tables A4 in the Appendix.

5.4. How do the results change when employees without access to pension schemes are excluded from the data?

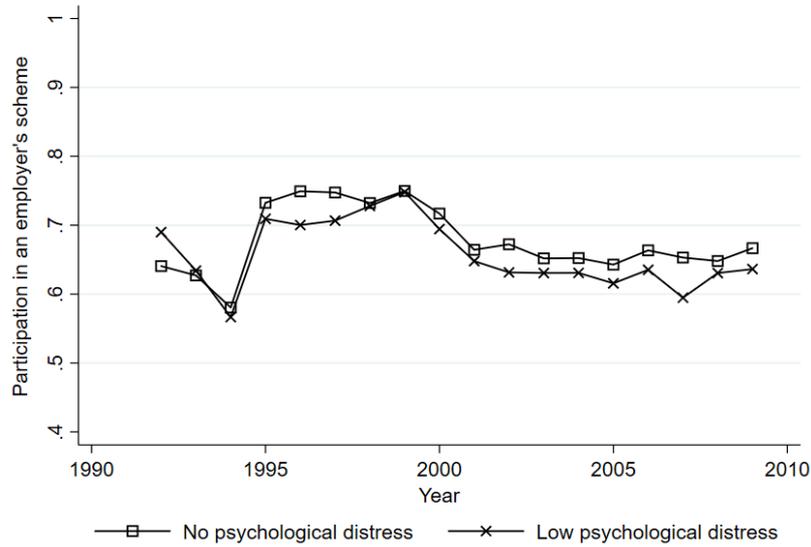
We repeat the specifications using the pension participation in an employer's scheme variable as it is in the data.¹⁸ Before automatic enrolment, the results show that male employees with psychological distress are 6.3 percentage points less likely to participate (significant at the 5 per cent level) in the model with no controls. This coefficient reduces to 4.3 percentage points (significant at the 5 per cent level) when key predictors of pension participation such as age, race, education, marital status, number of children and presence of a physical health condition are included in the model. The negative association is no longer significant when income, occupation type and industry type are accounted for. Any negative associations between baseline psychological distress and participation in a workplace pension scheme are no longer significant after the implementation of automatic enrolment. Female employees with psychological distress are 5.1 percentage points less likely to participate in a workplace pension scheme in the model with no controls. This negative association is no longer significant when physical health conditions are accounted for. Any negative association between psychological distress and pension participation for female employees is no longer present after the introduction of automatic enrolment.

5.5. Does the mental health gap exist prior to 2009?

We replicated the key charts showing trends in pension participation in an employer's scheme by contemporaneous psychological distress in the descriptive analysis section of this paper using data from the British Household Panel Survey (BHPS) going back to 1991. The differences in pension participation rates between private sector employees with and without psychological distress begin after 1995 and becomes more pronounced in the 2000s. Across both genders, the difference in pension participation in a workplace scheme from 1991 to 2009 between private sector employees with and without psychological distress is 2.6 per cent which is significant at the 0.1 per cent level. Male private sector employees with psychological distress are 1.8 per cent less likely (significant at the 5 per cent level) to participate in an employer's pension scheme. The differences among female private sector employees are not significant.

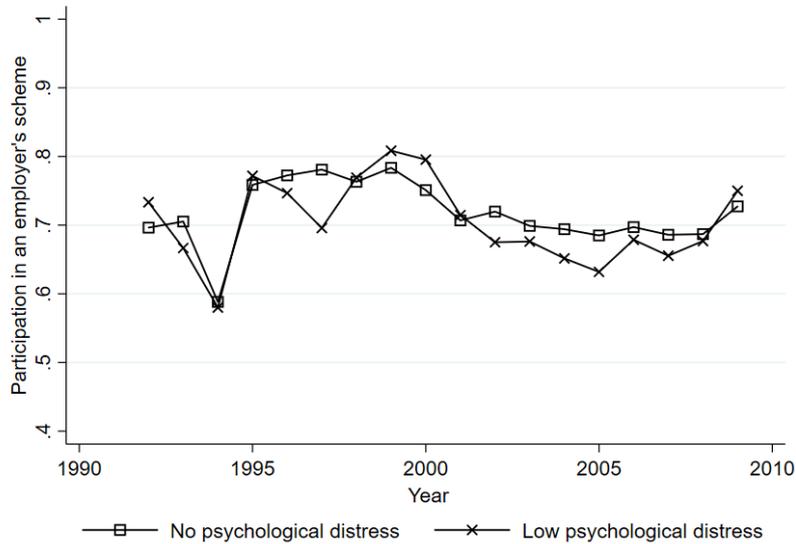
¹⁸ Results are available in Tables A5 in the Appendix.

Figure 5(a) : Pension participation rates by contemporaneous psychological distress for employees in the private sector using BHPS data



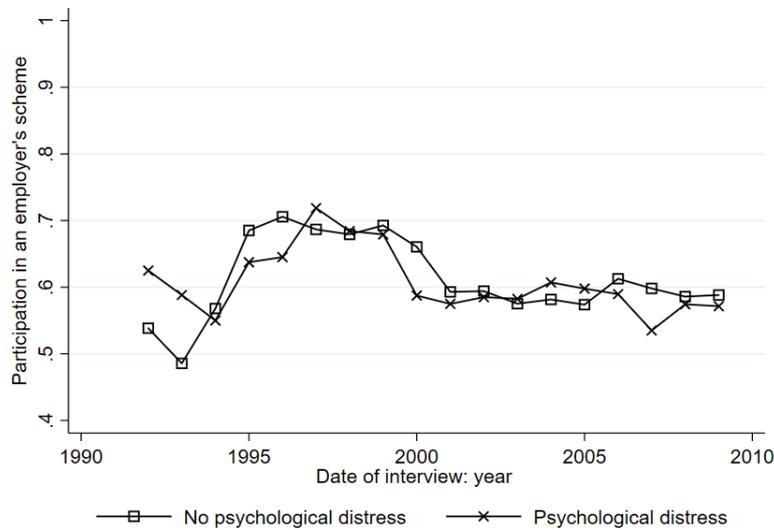
Sample: Private employees aged 22 to 65 years old. Psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale on a yearly basis.

Figure 5(b) : Pension participation rates by contemporaneous psychological distress for male employees in the private sector using BHPS data



Sample: Male private employees aged 22 to 65 years old. Psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale on a yearly basis.

Figure 5(c) : Pension participation rates by contemporaneous psychological distress for female employees in the private sector using BHPS data



Sample: Female private employees aged 22 to 65 years old. Psychological distress refers to individuals scoring 3 and above and no psychological distress refers to individuals scoring below 3 on the GHQ-12 scale on a yearly basis.

5. Discussion

This paper contributes to empirical evidence on the link between poor mental health and financial decision-making. We show a negative association between poor mental health and participation in a workplace pension scheme prior to automatic enrolment among both male and female employees in the private sector that are robust to most of the key predictors of pension participation including physical health conditions. The mental health gap in pension coverage closes following the introduction of pension automatic enrolment in the UK. This finding provides further support to automatic enrolment policies which have already been shown to reduce gaps in pension participation among financially vulnerable groups such as female employees and low income employees in the UK (Emmerson and Cribb 2016; Department for Work and Pensions 2018).

Our findings contribute to a deeper understanding of how poor mental health may affect lifetime earnings. If people with poor mental health are less likely to participate in a workplace pension scheme, they will have less income and consequently less financial security in retirement. Moreover, as people with poor mental health earn less to begin with (Smith 2009; Smith and Smith 2010), the income level at which the threshold is set may systematically exclude these group of employees from pension participation. As we have shown, most people with poor mental health in the private sector in the UK do meet this threshold but they

are less likely to do so by 5 percentage points. Prior to automatic enrolment, these employees were also more likely to work with employers who did not provide access to a workplace pension scheme. It would be vital to understand if this finding replicates in other countries without automatic or mandatory enrolment pensions policies in place. An important area that is outside the scope of this paper is whether unemployment which tends to be higher among people with poor mental health (see Moustერი et al. 2019; Bubonya, Cobb-Clark, and Ribar 2019) lowers the probability of pension participation for these workers.

This paper has limitations. As mental health is not randomly assigned, the results here are observational and we are not able to provide causal inferences. To get closer to a causal estimate, the earliest possible measure of mental health would have been ideal where the randomization of mental health states are, in most cases, not feasible. The use of a multiple difference-in-differences model to estimate the causal effect of automatic enrolment on the mental health gap in pension participation was not possible due to an issue in the number of employees variable required to identify the year in which the employer implemented automatic enrolment. Although UKHLS asks respondents to provide the number of employees, this question is framed in the context of the respondent's workplace and not the overall company where they are employed¹⁹. When pension participation in a workplace pension scheme is plotted against this specific number of employees variable²⁰, we observe that respondents who report working in smaller firms (199 employees and less) experience huge increases in pension participation at the time when only large firms (200 and more employees) began automatic enrolment. Based on reports by the Department for Work and Pensions, there was no mention of any early automatic enrolment by smaller firms. The majority of employers complied with their staging dates and availed of the three months extension. We also checked the distribution of the number of employees as provided by UKHLS against the distribution of the number of employees reported directly by employers through the UK's Business Population Estimates²¹. This simple comparison shows that the distribution of smaller firms (49 employees and less) is much larger in UKHLS than in BEIS which provides support to the assumption that respondents in UKHLS are providing the number of employees at their actual workplace as opposed to their company as a whole.

Although we measure mental health using one of the most credible and commonly used screening tools for psychiatric disorders through the GHQ-12, we are unable

¹⁹ The specific question is "How many people are employed at the place where you work?"

²⁰ See Figure 2 in the Appendix.

²¹ See Figure 3 in the Appendix.

to capture specific mental health conditions. This lack of granularity impedes us from investigating the role of different mental health conditions in contributing to the association that we observe between psychological distress and pension participation. This is a potentially interesting area as the variation in symptoms across different mental health conditions such as anxiety and depression may have different implications on how mental health relates to pension participation decisions. Further, our measure of pension participation is self-reported and we lack objective data about whether and how much respondents save in a workplace pension scheme. Future work could potentially address some of these limitations through the use of administrative-data linkage to provide objective data on pension participation including data on contribution rates. Such data may also provide accurate figures for the number of employees in a company which will enable the causal identification of the impact of automatic enrolment on the mental health gap in pension participation through the use of a multiple difference-in-differences framework. Recent studies in the mental health and economics literature has also explored the use of sibling fixed effects (e.g. Currie and Stabile 2006; Fletcher 2010; Anderson, Cesur, and Tekin 2015; Egan, Daly, and Delaney 2016; Mousteri et al. 2019) models or genetic data (e.g. Ding et al. 2009; Fletcher and Lehrer 2009) to address some of these issues. These methods could potentially be used to provide further causal estimates where the relevant data is available.

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Appendix

GHQ-12 Questions

The next questions are about how you have been feeling over the last few weeks

1	Have you recently been able to concentrate on whatever you are doing?
2	Have you recently lost much sleep over worry?
3	Have you recently felt that you were playing a useful part in things?
4	Have you recently felt capable about making decisions about things?
5	Have you recently felt constantly under strain?
6	Have you recently felt you couldn't overcome your difficulties?
7	Have you recently been able to enjoy your normal day-to-day activities?
8	Have you recently been able to face up to problems?
9	Have you recently been feeling unhappy or depressed?
10	Have you recently been losing confidence in yourself?
11	Have you recently been thinking of yourself as a worthless person?
12	Have you recently been feeling reasonably happy all things considered?

Answer options for Question 1

1	Better than usual
2	Same as usual
3	Less than usual
4	Much less than usual

Answer options for Questions 3,4,7,8 and 12

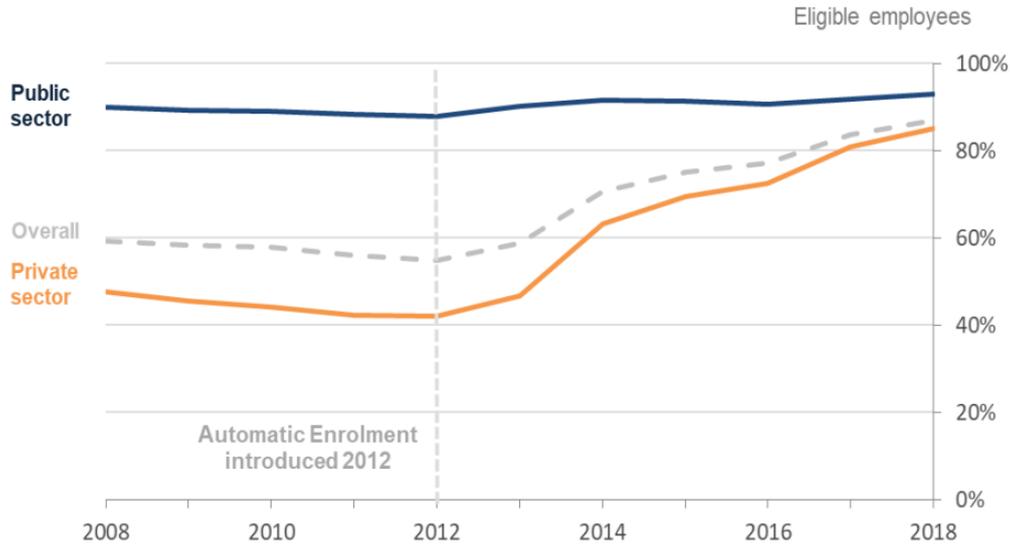
1	More so than usual
2	Same as usual
3	Less so than usual
4	Much less than usual

Answer options for Questions 2, 5, 6, 9, 10, 11 and 12

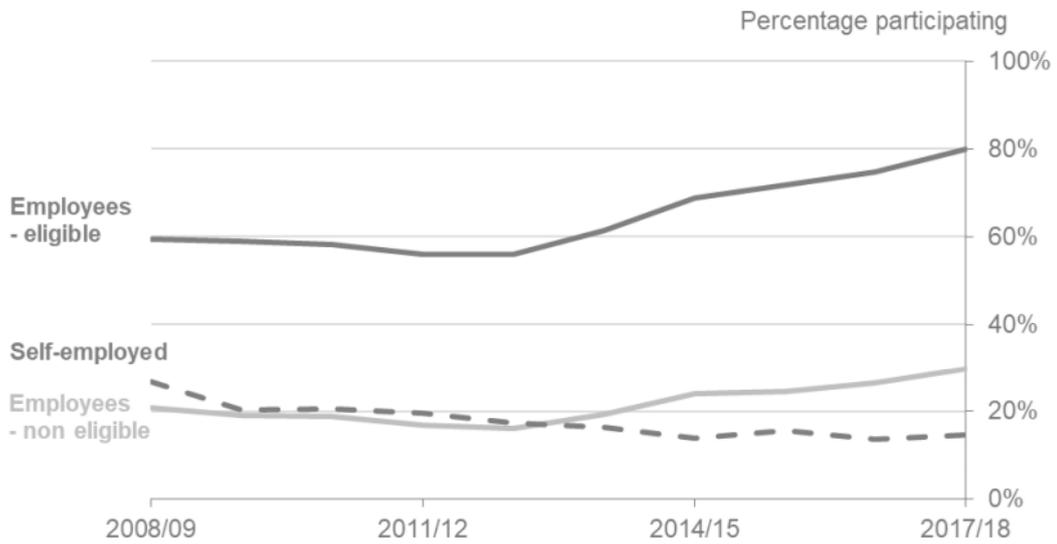
1	Not at all
2	No more than usual
3	Rather more than usual
4	Much more than usual

Pension participation trends from The Department for Work and Pensions

Figure 1: Pension participation in a workplace scheme in the public and private sector in the UK



Source: DWP estimates derived from the ONS ASHE, GB, 2008 to 2018



Source: Modelled analysis derived from the FRS, UK, 2008/09 to 2017/18

Table A1: Comparison of industry types between individuals with and without psychological distress

	No psychological distress	Psychological distress (GHQ-12 \geq 3)
Agriculture, Forestry	0.8%	0.4%
Fisheries	0.02%	0.03%
Energy/Water	0.9%	0.8%
Mining	0.4%	0.3%
Chemicals	0.9%	0.9%
Synthetics	0.4%	0.3%
Earth/Clay/Stone	0.3%	0.3%
Iron/Steel	0.3%	0.2%
Mechanical Engineering	3.7%	3.2%
Electrical Engineering	1.0%	1.0%
Wood/Paper/Printing	1.6%	1.4%
Clothing/Textiles	1.3%	1.6%
Food Industry	1.4%	0.9%
Construction	2.9%	2.5%
Construction related	2.9%	2.1%
Wholesale	2.1%	2.0%
Trading agents	0.1%	0.1%
Retail	9.1%	10.1%
Train systems	0.3%	0.6%
Communication/Entertainment	3.2%	3.7%
Other transport	4.0%	3.6%
Financial Institutions	3.0%	2.6%
Insurance	0.9%	0.9%
Restaurants	3.8%	3.7%
Service Industries	1.3%	1.2%
Trash removal	0.4%	0.3%
Education/Sport	14.0%	15.3%
Health Services	9.4%	8.8%
Legal Services	2.9%	2.8%
Other Services	9.2%	9.6%
Volunteering/Church	9.0%	10.3%
Private households	0.2%	0.2%
Public administration	8.2%	7.8%
Social Services	0.3%	0.6%

Table A2 (a) : The relationship between baseline psychological distress captured in Wave 1 (2009 and 2010) on pension participation in a workplace scheme prior to automatic enrolment in Wave 1 and 2 (2009 – 2011) among male employees in the private sector

	(1)	(2)	(3)	(4)	(5)	(6)
Baseline psychological distress	-0.0513** (0.0160)	-0.0362* (0.0156)	-0.0409** (0.0158)	-0.0304* (0.0149)	-0.0316* (0.0148)	-0.0426** (0.0157)
Age		0.00622*** (0.000615)	0.00617*** (0.000637)	0.00407*** (0.000596)	0.00430*** (0.000602)	0.00655*** (0.000642)
Base: Did not complete high school						
GSCE/O Levels		-0.00693 (0.0220)	0.00158 (0.0228)	-0.0372 (0.0216)	-0.0406 (0.0217)	-0.00679 (0.0228)
Degree/Diploma		0.179*** (0.0213)	0.180*** (0.0219)	0.0259 (0.0222)	0.0197 (0.0223)	0.158*** (0.0221)
Monthly income				0.0000658*** (0.00000488)	0.0000649*** (0.00000487)	
Base: White						
Asian		-0.210*** (0.0168)	-0.209*** (0.0175)	-0.107*** (0.0172)	-0.0948*** (0.0176)	-0.179*** (0.0181)
Black		-0.175*** (0.0273)	-0.176*** (0.0282)	-0.0749** (0.0252)	-0.0641* (0.0253)	-0.147*** (0.0281)
Base: Single						
Married		0.0517*** (0.0114)	0.0507*** (0.0112)	0.0450*** (0.0114)	0.0499*** (0.0143)	
Number of children		0.00181 (0.0288)	0.0121 (0.0311)	0.00338 (0.0294)	0.000846 (0.0292)	0.00699 (0.0306)
Base: Unskilled occupation						
Professional Occupation				0.169*** (0.0325)	0.161*** (0.0326)	
Managerial & Technical Occupation				0.164*** (0.0235)	0.157*** (0.0236)	
Skilled non-manual				0.0925*** (0.0249)	0.0891*** (0.0250)	
Skilled manual				0.0417 (0.0216)	0.0386 (0.0216)	
Partly skilled manual				0.0765** (0.0242)	0.0738** (0.0242)	
Base: Retail						
Agriculture, Forestry				-0.0472 (0.0649)	-0.0469 (0.0650)	
Fisheries				-0.245*** (0.0365)	-0.239*** (0.0361)	

Energy/Water	0.253*** (0.0436)	0.252*** (0.0434)
Mining	0.211** (0.0678)	0.209** (0.0673)
Chemicals	0.288*** (0.0458)	0.285*** (0.0456)
Synthetics	0.0310 (0.0604)	0.0292 (0.0607)
Earth/Clay/Stone	0.229** (0.0728)	0.232** (0.0724)
Iron/Steel	0.282*** (0.0646)	0.283*** (0.0641)
Mechanical Engineering	0.145*** (0.0268)	0.143*** (0.0268)
Electrical Engineering	0.216*** (0.0389)	0.215*** (0.0388)
Wood/Paper/Printing	0.0469 (0.0352)	0.0469 (0.0352)
Clothing/Textiles	0.0199 (0.0460)	0.0203 (0.0459)
Food Industry	0.0972** (0.0365)	0.0977** (0.0364)
Construction	-0.0414 (0.0327)	-0.0415 (0.0327)
Construction related	-0.0513 (0.0296)	-0.0513 (0.0296)
Wholesale	0.0571 (0.0314)	0.0548 (0.0314)
Trading agents	0.282* (0.138)	0.264* (0.132)
Train system	0.610*** (0.0324)	0.612*** (0.0326)
Communication/Entertainment	0.168*** (0.0364)	0.162*** (0.0365)
Other Transportation	0.0385 (0.0270)	0.0386 (0.0270)
Financial Institution	0.278*** (0.0311)	0.276*** (0.0309)
Insurance	0.315*** (0.0451)	0.312*** (0.0452)
Restaurants	-0.135*** (0.0249)	-0.136*** (0.0248)

Service Industries				-0.0151 (0.0941)	-0.0154 (0.0943)	
Trash removal				0.0275 (0.0686)	0.0232 (0.0694)	
Education/Sport				-0.0336 (0.0330)	-0.0356 (0.0329)	
Health services				0.0167 (0.0742)	0.0132 (0.0740)	
Legal services				0.00777 (0.0430)	0.00451 (0.0427)	
Other services				-0.0463* (0.0231)	-0.0481* (0.0230)	
Volunteering/Church				-0.137*** (0.0338)	-0.137*** (0.0338)	
Private households				0.155 (0.150)	0.138 (0.150)	
Public administration				0.116 (0.0624)	0.113 (0.0626)	
Social Services				-0.202*** (0.0319)	-0.209*** (0.0319)	
Has at least one physical health conditions		-0.00542 (0.0116)		0.00390 (0.0110)	0.00385 (0.0109)	-0.00505 (0.0116)
Word recall					0.00872 (0.00622)	0.0154* (0.00674)
Delayed word recall					0.00264 (0.00500)	0.00570 (0.00536)
Basic math					-0.000987 (0.00477)	0.00677 (0.00511)
Verbal fluency					0.00203 (0.00109)	0.00395*** (0.00116)
_cons	0.419*** (0.00591)	0.0810** (0.0298)	0.0881** (0.0309)	-0.0556 (0.0369)	-0.168*** (0.0501)	-0.168*** (0.0493)
N	11777	10561	10024	9770	9770	10024
R-sq	0.001	0.085	0.083	0.219	0.221	0.089

These results are based on the sample of male employees aged 22 to 65 years in the private sector.

The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

Table A2 (b) : The relationship between baseline psychological distress captured in Wave 1 (2009 and 2010) on pension participation in a workplace scheme prior to automatic enrolment in Wave 1 and 2 (2009 – 2011) among female employees in the private sector

	(1)	(2)	(3)	(4)	(5)	(6)
Baseline psychological distress	-0.0357** (0.0137)	-0.0266 (0.0138)	-0.0246 (0.0140)	-0.0261* (0.0124)	-0.0264* (0.0124)	-0.0258 (0.0140)
Age		0.00397*** (0.000650)	0.00392*** (0.000667)	0.00369*** (0.000585)	0.00376*** (0.000588)	0.00407*** (0.000670)
Base: Did not complete high school						
GSCE/O Levels		0.0616** (0.0221)	0.0606** (0.0225)	-0.00506 (0.0206)	-0.00666 (0.0206)	0.0522* (0.0225)
Degree/Diploma		0.155*** (0.0219)	0.155*** (0.0223)	-0.0264 (0.0206)	-0.0301 (0.0207)	0.136*** (0.0224)
Monthly income				0.000111*** (0.00000705)	0.000111*** (0.00000705)	
Base: White						
Asian		-0.0889*** (0.0211)	-0.0900*** (0.0218)	-0.0625** (0.0197)	-0.0562** (0.0200)	-0.0684** (0.0220)
Black		-0.0460 (0.0256)	-0.0466 (0.0259)	-0.0111 (0.0231)	-0.00522 (0.0233)	-0.0226 (0.0260)
Base: Single						
Married		0.0618*** (0.0152)	0.0612*** (0.0155)	0.0291* (0.0137)	0.0285* (0.0137)	0.0590*** (0.0155)
Number of children		-0.0167** (0.00646)	-0.0191** (0.00656)	0.00931 (0.00578)	0.00892 (0.00578)	-0.0199** (0.00652)
Base: Unskilled occupation						
Professional Occupation				0.195*** (0.0411)	0.189*** (0.0412)	
Managerial & Technical Occupation				0.132*** (0.0251)	0.127*** (0.0252)	
Skilled non-manual				0.0842*** (0.0229)	0.0801*** (0.0230)	
Skilled manual				0.0399 (0.0266)	0.0375 (0.0266)	
Partly skilled manual				0.0205 (0.0224)	0.0184 (0.0225)	
Base: Retail						
Agriculture, Forestry				-0.0914 (0.0809)	-0.0893 (0.0805)	
Fisheries				0.280*** (0.0566)	0.281*** (0.0564)	

Energy/Water	0.468*** (0.0566)	0.469*** (0.0571)
Mining	0.273*** (0.0488)	0.269*** (0.0489)
Chemicals	0.239* (0.109)	0.236* (0.109)
Synthetics	0.299** (0.0966)	0.300** (0.0974)
Earth/Clay/Stone	0.0812 (0.232)	0.0826 (0.235)
Iron/Steel	0.0647 (0.0419)	0.0637 (0.0420)
Mechanical Engineering	0.0202 (0.0606)	0.0210 (0.0605)
Electrical Engineering	0.128** (0.0481)	0.125** (0.0482)
Wood/Paper/Printing	-0.0846* (0.0396)	-0.0829* (0.0395)
Clothing/Textiles	0.0968* (0.0482)	0.0981* (0.0483)
Food Industry	-0.0421 (0.0468)	-0.0410 (0.0468)
Construction	-0.111* (0.0554)	-0.113* (0.0559)
Construction related	0.0385 (0.0361)	0.0376 (0.0361)
Wholesale	0.252 (0.152)	0.252 (0.153)
Trading agents	0.361*** (0.0839)	0.363*** (0.0836)
Train system	0.0297 (0.0395)	0.0303 (0.0396)
Communication/Entertainment	0.0545 (0.0357)	0.0534 (0.0357)
Other Transportation	0.343*** (0.0278)	0.342*** (0.0279)
Financial Institution	0.354*** (0.0448)	0.355*** (0.0448)
Insurance	-0.152*** (0.0184)	-0.151*** (0.0184)
Restaurants	-0.155***	-0.158***

				(0.0217)	(0.0219)	
Service Industries				-0.0355 (0.154)	-0.0339 (0.153)	
Trash removal				0.0315 (0.0256)	0.0299 (0.0256)	
Education/Sport				-0.00545 (0.0297)	-0.00654 (0.0298)	
Health services				-0.0943** (0.0289)	-0.0954*** (0.0288)	
Legal services				-0.0572** (0.0218)	-0.0590** (0.0218)	
Other services				-0.142*** (0.0184)	-0.142*** (0.0184)	
Volunteering/Church				-0.196*** (0.0207)	-0.195*** (0.0205)	
Private households				0.178** (0.0565)	0.177** (0.0562)	
Public administration				0.206 (0.303)	0.203 (0.298)	
Social Services				-0.0914 (0.0809)	-0.0893 (0.0805)	
Has at least one physical health conditions		-0.0276* (0.0110)		-0.0110 (0.00979)	-0.0108 (0.00978)	-0.0265* (0.0109)
Word recall					0.00564 (0.00549)	0.0121 (0.00620)
Delayed word recall					0.00144 (0.00419)	0.00302 (0.00482)
Basic math					-0.00259 (0.00392)	0.00788 (0.00436)
Verbal fluency					0.00116 (0.00107)	0.00389** (0.00121)
_cons	0.318*** (0.00612)	0.0714* (0.0320)	0.0826* (0.0328)	-0.0699 (0.0378)	-0.127** (0.0491)	-0.130** (0.0490)
N	10640	9625	9315	9125	9125	9315
R-sq	0.001	0.039	0.040	0.252	0.252	0.045

These results are based on the sample of female employees aged 22 to 65 years in the private sector.

The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

Table A2 (c) : Baseline psychological distress in Wave 1 on pension participation in a workplace scheme in Wave 4 onwards (2012-2017) among males in the private sector (full regression results)

	(1)	(2)	(3)	(4)	(5)	(6)
Baseline psychological distress	0.0261 (0.0161)	0.00556 (0.0160)	0.00634 (0.0160)	0.0160 (0.0151)	0.0154 (0.0150)	0.00460 (0.0159)
Age		0.00271*** (0.000530)	0.00270*** (0.000532)	0.00113* (0.000510)	0.00119* (0.000513)	0.00287*** (0.000533)
Base: Did not complete high school						
GSCE/O Levels		0.0499* (0.0224)	0.0495* (0.0224)	0.0192 (0.0212)	0.0179 (0.0212)	0.0431 (0.0225)
Degree/Diploma		0.169*** (0.0214)	0.168*** (0.0214)	0.0514* (0.0215)	0.0484* (0.0216)	0.150*** (0.0217)
Monthly income				0.0000667*** (0.00000347)	0.0000660*** (0.00000348)	
Base: White						
Asian		-0.142*** (0.0162)	-0.143*** (0.0162)	-0.0820*** (0.0159)	-0.0758*** (0.0162)	-0.120*** (0.0166)
Black		-0.0743** (0.0264)	-0.0745** (0.0264)	-0.0142 (0.0248)	-0.00758 (0.0249)	-0.0524* (0.0263)
Base: Single						
Married		0.0872*** (0.0122)	0.0876*** (0.0122)	0.0231 (0.0119)	0.0219 (0.0119)	0.0818*** (0.0122)
Number of children		-0.00920 (0.0329)	-0.00930 (0.0329)	-0.00434 (0.0300)	-0.00424 (0.0300)	-0.00968 (0.0328)
Base: Unskilled occupation						
Professional Occupation				0.0672* (0.0284)	0.0600* (0.0285)	
Managerial & Technical Occupation				0.0452* (0.0227)	0.0407 (0.0228)	
Skilled non-manual				0.0250 (0.0242)	0.0220 (0.0243)	
Skilled manual				0.00379 (0.0218)	0.00178 (0.0218)	
Partly skilled manual				0.0305 (0.0240)	0.0295 (0.0240)	
Base: Retail						
Agriculture, Forestry				-0.260*** (0.0535)	-0.261*** (0.0537)	
Fisheries				-0.542*** (0.0258)	-0.512*** (0.0300)	

Energy/Water	0.0953** (0.0358)	0.0960** (0.0358)
Mining	0.0719 (0.0471)	0.0714 (0.0472)
Chemicals	0.168*** (0.0321)	0.166*** (0.0322)
Synthetics	-0.0192 (0.0511)	-0.0227 (0.0510)
Earth/Clay/Stone	0.0740 (0.0544)	0.0744 (0.0536)
Iron/Steel	0.133* (0.0518)	0.135** (0.0519)
Mechanical Engineering	0.0394 (0.0228)	0.0381 (0.0228)
Electrical Engineering	0.0688 (0.0368)	0.0694 (0.0366)
Wood/Paper/Printing	-0.00799 (0.0320)	-0.00814 (0.0320)
Clothing/Textiles	-0.0592 (0.0389)	-0.0608 (0.0391)
Food Industry	0.0851** (0.0313)	0.0853** (0.0314)
Construction	-0.0919** (0.0285)	-0.0913** (0.0285)
Construction related	-0.177*** (0.0303)	-0.177*** (0.0303)
Wholesale	-0.00527 (0.0276)	-0.00562 (0.0276)
Trading agents	-0.00241 (0.159)	-0.00879 (0.160)
Train system	0.297*** (0.0361)	0.295*** (0.0359)
Communication/Entertainment	0.139*** (0.0270)	0.136*** (0.0270)
Other Transportation	0.0248 (0.0241)	0.0245 (0.0241)
Financial Institution	0.143*** (0.0248)	0.141*** (0.0248)
Insurance	0.116** (0.0357)	0.113** (0.0356)
Restaurants	-0.165***	-0.164***

				(0.0271)	(0.0271)	
Service Industries				-0.207*	-0.209*	
				(0.105)	(0.105)	
Trash removal				-0.114*	-0.115*	
				(0.0524)	(0.0524)	
Education/Sport				-0.0165	-0.0161	
				(0.0286)	(0.0287)	
Health services				-0.0766	-0.0769	
				(0.0521)	(0.0522)	
Legal services				-0.0531	-0.0537	
				(0.0371)	(0.0372)	
Other services				-0.0766***	-0.0763***	
				(0.0207)	(0.0207)	
Volunteering/Church				-0.0876**	-0.0871**	
				(0.0328)	(0.0327)	
Private households				-0.228***	-0.218***	
				(0.0508)	(0.0490)	
Public administration				0.0575	0.0564	
				(0.0305)	(0.0304)	
Social Services				0.382***	0.374***	
				(0.0274)	(0.0290)	
Has at least one physical health conditions		0.00691		0.00899	0.00949	0.00895
		(0.0165)		(0.0157)	(0.0157)	(0.0164)
Word recall					0.00315	0.00775
					(0.00513)	(0.00555)
Delayed word recall					0.00252	0.00859
					(0.00418)	(0.00440)
Basic math					0.00750	0.0152***
					(0.00413)	(0.00431)
Verbal fluency					0.000324	0.00175
					(0.000886)	(0.000924)
_cons	0.588***	0.357***	0.357***	0.318***	0.249***	0.159***
	(0.00501)	(0.0293)	(0.0293)	(0.0358)	(0.0457)	(0.0423)
N	15356	13246	13238	13075	13075	13238
R-sq	0.000	0.037	0.037	0.129	0.129	0.042

These results are based on the sample of male employees aged 22 to 65 years in the private sector.

The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme which they are eligible for as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

Table A2 (d) : Baseline psychological distress in Wave 1 on pension participation in a workplace scheme in Wave 4 onwards (2012-2017) among females in the private sector (full regression results)

	(1)	(2)	(3)	(4)	(5)	(6)
Baseline psychological distress	0.00743 (0.0157)	-0.00885 (0.0158)	-0.00917 (0.0158)	-0.0110 (0.0142)	-0.0104 (0.0142)	-0.0104 (0.0158)
Age		0.00224*** (0.000616)	0.00225*** (0.000617)	0.00152** (0.000559)	0.00152** (0.000560)	0.00229*** (0.000618)
Base: Did not complete high school						
GSCE/O Levels		0.0521* (0.0245)	0.0518* (0.0245)	0.0107 (0.0223)	0.0122 (0.0223)	0.0459 (0.0246)
Degree/Diploma		0.163*** (0.0236)	0.163*** (0.0236)	-0.00182 (0.0222)	0.000779 (0.0222)	0.148*** (0.0238)
Monthly income				0.000115*** (0.00000584)	0.000115*** (0.00000585)	
Base: White						
Asian		-0.0453* (0.0194)	-0.0456* (0.0194)	-0.0196 (0.0182)	-0.0232 (0.0185)	-0.0316 (0.0196)
Black		0.0350 (0.0245)	0.0350 (0.0246)	0.0679** (0.0236)	0.0636** (0.0240)	0.0535* (0.0250)
Base: Single						
Married		0.0442** (0.0142)	0.0444** (0.0142)	0.00918 (0.0129)	0.00951 (0.0129)	0.0417** (0.0142)
Number of children		-0.0283*** (0.00611)	-0.0285*** (0.00612)	-0.00220 (0.00563)	-0.00184 (0.00564)	-0.0288*** (0.00611)
Base: Unskilled occupation						
Professional Occupation				0.150*** (0.0371)	0.154*** (0.0373)	
Managerial & Technical Occupation				0.178*** (0.0270)	0.181*** (0.0272)	
Skilled non-manual				0.133*** (0.0256)	0.136*** (0.0258)	
Skilled manual				0.172*** (0.0306)	0.173*** (0.0306)	
Partly skilled manual				0.131*** (0.0266)	0.132*** (0.0267)	
Base: Retail						
Agriculture, Forestry				-0.145 (0.0956)	-0.146 (0.0961)	
Fisheries				0.592*** (0.0202)	0.590*** (0.0203)	

Energy/Water	0.306*** (0.0341)	0.307*** (0.0342)
Mining	0.254*** (0.0478)	0.252*** (0.0477)
Chemicals	0.144*** (0.0373)	0.146*** (0.0374)
Synthetics	0.0953 (0.0773)	0.0950 (0.0772)
Earth/Clay/Stone	-0.0142 (0.120)	-0.0152 (0.120)
Iron/Steel	0.0211 (0.0978)	0.0182 (0.0972)
Mechanical Engineering	0.0502 (0.0366)	0.0496 (0.0365)
Electrical Engineering	0.0618 (0.0584)	0.0606 (0.0587)
Wood/Paper/Printing	-0.0542 (0.0479)	-0.0522 (0.0478)
Clothing/Textiles	-0.0201 (0.0423)	-0.0207 (0.0422)
Food Industry	0.0122 (0.0434)	0.0123 (0.0434)
Construction	-0.0995* (0.0435)	-0.0998* (0.0434)
Construction related	-0.239*** (0.0594)	-0.239*** (0.0594)
Wholesale	-0.0212 (0.0354)	-0.0207 (0.0354)
Trading agents	-0.0211 (0.137)	-0.0205 (0.136)
Train system	0.0832 (0.0608)	0.0809 (0.0607)
Communication/Entertainment	0.0412 (0.0358)	0.0411 (0.0358)
Other Transportation	0.0591 (0.0326)	0.0591 (0.0326)
Financial Institution	0.221*** (0.0248)	0.221*** (0.0248)
Insurance	0.210*** (0.0430)	0.210*** (0.0430)
Restaurants	-0.183***	-0.183***

			(0.0230)	(0.0230)		
Service Industries			-0.265*** (0.0352)	-0.265*** (0.0352)		
Trash removal			0.141 (0.105)	0.139 (0.104)		
Education/Sport			0.00369 (0.0233)	0.00440 (0.0233)		
Health services			-0.00674 (0.0269)	-0.00535 (0.0268)		
Legal services			-0.0548* (0.0263)	-0.0542* (0.0263)		
Other services			-0.0830*** (0.0208)	-0.0818*** (0.0208)		
Volunteering/Church			-0.144*** (0.0190)	-0.144*** (0.0190)		
Private households			-0.403*** (0.0589)	-0.403*** (0.0586)		
Public administration			0.106** (0.0338)	0.107** (0.0337)		
Social Services			0.300*** (0.0880)	0.300*** (0.0885)		
Has at least one physical health conditions		-0.00990 (0.0169)	0.0215 (0.0153)	0.0209 (0.0153)		-0.00700 (0.0169)
Word recall				-0.000928 (0.00541)		0.0127* (0.00589)
Delayed word recall				-0.00273 (0.00412)		-0.00184 (0.00454)
Basic math				0.00125 (0.00366)		0.0119** (0.00404)
Verbal fluency				-0.000692 (0.000966)		0.00165 (0.00108)
_cons	13640	11625	11615	11467	11467	11615
	0.000	0.025	0.025	0.176	0.176	0.027
	13640	11625	11615	11467	11467	11615
N	0.000	0.025	0.025	0.176	0.176	0.027
R-sq	13640	11625	11615	11467	11467	11615

These results are based on the sample of female employees aged 22 to 65 years in the private sector.

The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

Table A3(a) : Baseline psychological distress (GHQ score equal to or greater than 6) on pension participation among male employees in the private sector prior to automatic enrolment

Baseline psychological distress	<i>Pooled OLS</i>	-0.059* (0.024)	-0.047* (0.023)	-0.050* (0.023)	-0.030 (0.021)	-0.035 (0.021)	-0.053* (0.023)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		11,777	10,561	10,024	9,770	9,770	10,024
N – Mundlak							
R-squared – Pooled OLS		0.001	0.085	0.082	0.22	0.22	0.089

These results are based on the sample of male employees aged 22 to 65 years in the private sector.

The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

Table A3(b) : Baseline psychological distress (GHQ score equal to or greater than 6) on pension participation among female employees in the private sector prior to automatic enrolment

Baseline psychological distress	<i>Pooled OLS</i>	1 -0.046* (0.018)	2 -0.030 (0.018)	3 -0.027 (0.018)	4 -0.031 (0.016)	5 -0.032 (0.016)	6 -0.029 (0.018)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		10,640	9,625	9,315	9,125	9,125	9,315
N – Mundlak							
R-squared – Pooled OLS		0.001	0.039	0.039	0.251	0.252	0.045

These results are based on the sample of female employees aged 22 to 65 years in the private sector.

The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme.

The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme which they are eligible as not participating in a workplace pension scheme.

Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

Table A3(c) : Baseline psychological distress (GHQ score equal to or greater than 6) on pension participation among male employees in the private sector after automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	0.006 (0.024)	-0.016 (0.023)	-0.015 (0.023)	0.003 (0.022)	0.002 (0.022)	-0.016 (0.023)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		15,356	13,246	13,238	13,075	13,075	13,238
N – Mundlak							
R-squared – Pooled OLS		0.000	0.037	0.037	0.129	0.129	0.042

These results are based on the sample of male employees aged 22 to 65 years in the private sector. The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme. The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme. Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications. *, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

Table A3(d) : Baseline psychological distress (GHQ score equal to or greater than 6) on pension participation among female employees in the private sector after automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	-0.031 (0.022)	-0.036 (0.022)	-0.037 (0.022)	-0.039 (0.022)	-0.034 (0.019)	-0.035 (0.019)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		13,640	11,625	11,615	11,467	11,467	11,615
N – Mundlak							
R-squared – Pooled OLS		0.000	0.025	0.025	0.176	0.176	0.028

These results are based on the sample of female employees aged 22 to 65 years in the private sector. The analysis employs baseline mental health captured in Wave 1 and contemporaneous pension participation in an employer's scheme. The analysis employs pension participation information in Wave 2, 4, 6 and 8. We capture those who respond "don't know" to whether their employer provides a scheme for which they are eligible and those who respond that their employer does not provide a scheme for which they are eligible as not participating in a workplace pension scheme. Standard errors are shown in parentheses. Standard errors clustered at the individual level for the pooled OLS specifications. *, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

Table A4(a) : Contemporaneous psychological distress on pension participation among male employees in the private sector prior to automatic enrolment

		1	2	3	4	5	6
Contemporaneous psychological distress	<i>Pooled OLS</i>	-0.037* (0.016)	-0.033* (0.017)	-0.034* (0.017)	-0.021 (0.016)	-0.022 (0.016)	-0.036* (0.017)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		7,439	7,416	7,087	6,901	6,901	7,087
N – Mundlak							
R-squared – Pooled OLS		0.001	0.081	0.078	0.189	0.191	0.084

These results are based on the sample of male employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A4(b) : Contemporaneous psychological distress on pension participation among female employees in the private sector prior to automatic enrolment

		1	2	3	4	5	6
Contemporaneous psychological distress	<i>Pooled OLS</i>	-0.031 (0.016)	-0.023 (0.017)	-0.020 (0.017)	-0.020 (0.016)	-0.022 (0.016)	-0.023 (0.017)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		5,888	5,882	5,696	5,562	5,562	5,696
N – Mundlak							
R-squared – Pooled OLS		0.001	0.055	0.054	0.198	0.199	0.058

These results are based on the sample of female employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A4(c) : Contemporaneous psychological distress on pension participation among male employees in the private sector after automatic enrolment

		1	2	3	4	5	6
Contemporaneous psychological distress	<i>Pooled OLS</i>	-0.023* (0.011)	-0.021 (0.012)	-0.021 (0.012)	-0.010 (0.014)	-0.010 (0.011)	-0.021 (0.012)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		11,220	9,739	9,734	9,623	9,623	9,734
N – Mundlak							
R-squared – Pooled OLS		0.000	0.024	0.024	0.064	0.064	0.026

These results are based on the sample of male employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A4(d) : Contemporaneous psychological distress on pension participation among female employees in the private sector after automatic enrolment

		1	2	3	4	5	6
Contemporaneous psychological distress	<i>Pooled OLS</i>	0.010 (0.012)	0.017 (0.012)	0.018 (0.012)	0.021 (0.012)	0.021 (0.012)	0.018 (0.012)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		8,912	7,667	7,662	7,561	7,561	7,662
N – Mundlak							
R-squared – Pooled OLS		0.000	0.018	0.018	0.094	0.094	0.020

These results are based on the sample of female employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A5(a) : Baseline psychological distress on pension participation (as it is) among male employees in the private sector prior to automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	-0.063* (0.020)	-0.039* (0.020)	-0.043* (0.020)	-0.028 (0.019)	-0.030 (0.019)	-0.046* (0.020)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Income			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		7,439	6,643	6,338	6,175	6,175	6,338
N – Mundlak							
R-squared – Pooled OLS		0.002	0.081	0.078	0.189	0.191	0.084

These results are based on the sample of male employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A5(b) : Baseline psychological distress on pension participation (as it is) among female employees in the private sector prior to automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	-0.051* (0.020)	-0.040* (0.020)	-0.039 (0.020)	-0.036 (0.019)	-0.037 (0.019)	-0.041* (0.020)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Income			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		5,888	5,309	5,133	5,012	5,012	5,133
N – Mundlak							
R-squared – Pooled OLS		0.002	0.056	0.055	0.198	0.199	0.059

These results are based on the sample of female employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A5(c) : Baseline psychological distress on pension participation (as it is) among male employees in the private sector after automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	0.011 (0.014)	-0.001 (0.014)	-0.001 (0.014)	0.006 (0.013)	0.005 (0.013)	-0.002 (0.014)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		11,220	9,739	9,734	9,623	9,623	9,734
N – Mundlak							
R-squared – Pooled OLS		0.000	0.023	0.023	0.064	0.064	0.026

These results are based on the sample of male employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A5(d) : Baseline psychological distress on pension participation (as it is) among female employees in the private sector after automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	0.002 (0.016)	-0.013 (0.016)	-0.013 (0.016)	-0.015 (0.015)	-0.014 (0.016)	-0.014 (0.016)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		8,912	7,667	7,662	7,561	7,561	7,662
N – Mundlak							
R-squared – Pooled OLS		0.000	0.018	0.018	0.094	0.094	0.019

These results are based on the sample of female employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A5(a) : Baseline psychological distress on pension participation (as it is) among male employees in the private sector prior to automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	-0.063* (0.020)	-0.039* (0.020)	-0.043* (0.020)	-0.028 (0.019)	-0.030 (0.019)	-0.046* (0.020)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Income			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		7,439	6,643	6,338	6,175	6,175	6,338
N – Mundlak							
R-squared – Pooled OLS		0.002	0.081	0.078	0.189	0.191	0.084

These results are based on the sample of male employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A5(b) : Baseline psychological distress on pension participation (as it is) among female employees in the private sector prior to automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	-0.051* (0.020)	-0.040* (0.020)	-0.039 (0.020)	-0.036 (0.019)	-0.037 (0.019)	-0.041* (0.020)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Income			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		5,888	5,309	5,133	5,012	5,012	5,133
N – Mundlak							
R-squared – Pooled OLS		0.002	0.056	0.055	0.198	0.199	0.059

These results are based on the sample of female employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

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*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A5(c) : Baseline psychological distress on pension participation (as it is) among male employees in the private sector after automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	0.011 (0.014)	-0.001 (0.014)	-0.001 (0.014)	0.006 (0.013)	0.005 (0.013)	-0.002 (0.014)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		11,220	9,739	9,734	9,623	9,623	9,734
N – Mundlak							
R-squared – Pooled OLS		0.000	0.023	0.023	0.064	0.064	0.026

These results are based on the sample of male employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Table A5(d) : Baseline psychological distress on pension participation (as it is) among female employees in the private sector after automatic enrolment

		1	2	3	4	5	6
Baseline psychological distress	<i>Pooled OLS</i>	0.002 (0.016)	-0.013 (0.016)	-0.013 (0.016)	-0.015 (0.015)	-0.014 (0.016)	-0.014 (0.016)
Age			√	√	√	√	√
Education			√	√	√	√	√
Race			√	√	√	√	√
Marital status			√	√	√	√	√
Number of children			√	√	√	√	√
Presence of a physical health condition				√	√	√	√
Income					√	√	
Occupation type					√	√	
Industry					√	√	
Cognitive ability						√	√
N – Pooled OLS		8,912	7,667	7,662	7,561	7,561	7,662
N – Mundlak							
R-squared – Pooled OLS		0.000	0.018	0.018	0.094	0.094	0.019

These results are based on the sample of female employees aged 22 to 65 years in the private sector.

Standard errors are shown in parentheses.

Standard errors clustered at the individual level for the pooled OLS specifications.

*, **, *** indicates significance at the 0.1, 1 and 5 per cent levels respectively

The analysis employs pension participation information in Wave 1, 2, 4, 6 and 8. This is the original pension participation variable as provided by UKHLS.

Number of employees' variable (jbsize) in UKHLS

Figure 2: Number of employees variable plotted against pension participation in a workplace scheme

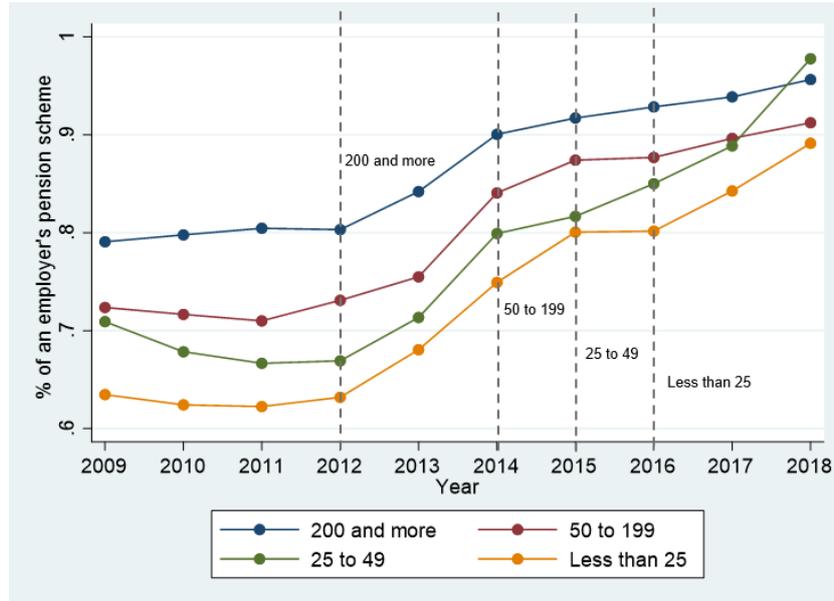


Figure 3: Number of employees distribution in UKHLS compared to number of employees (as reported by the employer) in Business Population Estimates (BEIS)

