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Abstract

Existing evidence on the effectiveness of automatic enrolment is focused on large employers. We compare pension savings of employees working for small employers who were pseudo-randomly affected by automatic enrolment with those working for small employers who, at the same moment in time, were not. We find that automatic enrolment substantially increased workplace pension participation among those working for small employers by around 45 percentage points to reach 70% of targeted employees – with most, but not all, brought in at relatively low rates of pension saving. Despite this large increase, this leaves pension participation substantially below the very high levels (around 90%) seen under automatic enrolment among the largest employers in the United Kingdom and the United States. We find evidence that this lower participation rate is not explained either by differences in the observed characteristics of workers between smaller and larger employers, or by differences in the pension contributions offered by employers.

Keywords: automatic enrolment; non-wage benefits; private pensions; small employers

JEL codes: D14; J32; J38

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1. Introduction

Automatic enrolment into pensions is an increasingly popular way of encouraging workers to save more for their retirement. Alongside its nationwide introduction in the UK, increasing numbers of US states – specifically California, Connecticut, Illinois, Maryland and Oregon (see Ghilarducci and Fisher, 2017) – have legislated to enact policies that oblige employers to enrol employees into a workplace pension plan. Elsewhere, Germany, Ireland and Poland are planning or actively considering introducing automatic enrolment.[1]

Despite these policy developments, almost all the evidence on the effect of automatic enrolment comes from its introduction in large employers, either in the United States where some employers chose to introduce automatic enrolment (Madrian and Shea, 2001; Choi et al., 2004; Beshears et al., 2010), or in the United Kingdom where – by 2015 – the government had obliged all large and medium-sized employers to introduce automatic enrolment (Cribb and Emmerson, 2016). In both cases, participation rates in workplace pension plans have been shown to be around (or greater than) 90%, with many employees sticking to the default contribution rates.

There is no evidence to date on the effect of automatic enrolment on pension saving when it is introduced by small employers (either voluntarily or because they have been obligated to do it). This is an important evidence gap for two reasons.

First, large fractions of employees work for small or very small employers. According the OECD (2019), 28% of employees in the United Kingdom work for an employer with fewer than 50 employees, and 16% work for an employer with fewer than 10 employees. The proportion working for these small businesses are also high in the United States (18% and

[1] In addition, in 2007, New Zealand introduced automatic enrolment into its 'KiwiSaver' scheme. However, this scheme also had a 50% match rate from the government, an initial government contribution of NZD$1,000, and savings could be put towards purchasing a first home instead of being used for retirement.

10%, respectively) and Germany (20% and 11%) and, particularly, France (30% and 19%) and Japan (30% and 18%).

Second, in the absence of automatic enrolment, pension participation is substantially lower among employees of smaller private-sector employers. For example, in the United States in 2016, only 33% of employees working for employers with fewer than 50 employees were enrolled in a workplace pension plan, compared with 76% of those working for employers with 500 or more employees. Prior to automatic enrolment (in 2012), the United Kingdom had lower rates of pension participation, but an almost identical gradient by employer size, with the equivalent figures being 17% and 40%.[2] This paper is the first to provide evidence on the impact of automatic enrolment among small employers.

There are a number of mechanisms through which automatic enrolment can increase participation in workplace pensions. First, automatic enrolment exploits inertia as people put off leaving a pension plan rather than putting off joining one (O'Donoghue and Rabin, 1999). Second, with default contributions and asset allocations, automatic enrolment reduces the complexity of the pension-saving decision. Higher complexity is known to lead to people to put off decisions (Tversky and Shafir, 1992), and making decisions simpler has previously been shown to increase pension participation (Beshears et al., 2013). Third, there may be 'endorsement effects', which mean that participating is seen as implicit advice on the best course of action (Beshears et al., 2009). Fourth, some employees who are automatically enrolled would not have been offered an employer contribution to their pension previously, and now will receive at least a small employer contribution if they participate. These

[2] US figures ate taken from Bureau of Labor Statistics (2016). UK figures are authors' calculations using the ASHE.

employees may therefore choose to stay in their workplace pension in order to receive this (albeit potentially small) employer contribution.

Most importantly for this paper, there also two important reasons that the effect of automatic enrolment on the employees of small employers might differ from those of larger employers where automatic enrolment has, to date, been introduced.

First, the types of employees working for smaller employers may be systematically different from those working for larger employers in ways that affect how they respond to automatic enrolment. Employees of smaller firms have lower earnings than those working for larger firms (Bloom et al., 2018) and move firms more often (Topel and Ward, 1992), both of which will reduce the attractiveness of pension participation. As, historically, small employers have been less likely to make contributions to workplace pensions, workers with lower discount rates or more self-control (see Laibson et al., 1998) may choose disproportionately to work for larger employers who provide more generous pensions. Some employers may offer more generous pension arrangements specifically to recruit and retain the types of employees attracted by this (Lazear and Shaw, 2007).

These differences may mean that – even under automatic enrolment – fewer employees of small employers participate in workplace pensions. Moreover, in other contexts, employees of small firms have been shown to respond to other pension reforms differently from those in larger firms; Gallo et al. (2018) find that employees of smaller firms were less likely to transfer future severance pay into a pension fund after the 2007 Italian pension reforms.

Second, the way in which employers respond to the obligation to enrol their targeted workers automatically may differ with the size of the employer. If there are fixed costs in setting up, or administering, workplace pension plans for their employees, then it will be relatively more costly for small employers to provide pensions for their employees. In the related literature

on the provision of employee health insurance, there is evidence that the response of smaller employers to the price of providing health insurance is more elastic (Feldman et al., 1997; Gruber and Lettau, 2004). Therefore, small employers may respond to the obligation to enrol their employees automatically into a pension plan in a way that reduces the probability of employees participating. In particular, they may be more likely to make only minimum employer contributions, rather than providing more generous (or matched) contributions.

In this paper, we exploit a feature of the introduction of automatic enrolment among small employers (those with between 2 and 29 employees) in the UK, in which the last two digits of an employer's assigned payroll tax code determined when they had to introduce automatic enrolment. Using employer-reported data on workplace pension savings from April 2016, and exploiting this pseudo-random feature of the rollout, we find that automatic enrolment substantially increased participation in workplace pensions for targeted employees of small private-sector employers by around 45 percentage points (ppts) to reach 70%. Although this is a very large increase, participation is still well below the very high levels (around 90%) seen among the largest employers. We show that this lower participation among small employers cannot be rationalised by differences in earnings, age, job tenure or other observed employee and employer characteristics between small and large employers. We also find evidence that the lower participation in pensions is not driven by the lower employer and employee pension contributions that are, on average, offered by small employers compared with larger employers.

The remainder of this paper proceeds as follows. In Section 2, we describe the policy background to this paper, including details of the nationwide rollout of automatic enrolment. In Section 3, we describe the data used, and the empirical strategy employed, in this paper. We present the results in Section 4 and we conclude in Section 5.

2. Policy background

In this section, we briefly describe the UK pensions policy environment. Employees accrue entitlement to a flat-rate state pension, which, in 2016–17, was worth up to £155.65 per week or just under 30% of median full-time earnings. The resulting state pension is received from the state pension age (which, in April 2016, was 65 for men and 63 for women) and, while taxable, is not means-tested or subject to any earnings test.

The longstanding low level of state pension relative to average earnings means private pensions play a significant role in providing retirement income. Contributions to private pensions are made before income tax, and any returns from investments held in the pension are re-invested untaxed. On withdrawal, one-quarter is tax-free while three-quarters are subject to income tax. Employer contributions to private pensions are treated particularly favourably by the tax system as neither they nor the pension income they generate are subject to the payroll tax (known as National Insurance contributions in the UK).

Despite this favourable tax treatment, in 2012 only 36% of private-sector employees were active participants in a workplace pension plan (i.e. one facilitated by, but not necessarily run by, their employer), compared to 85% of public-sector workers (Cribb and Emmerson, 2016). Prior to 2012, participation in workplace pensions among private-sector employees had been falling: from 48% in 1997 to 36% in 2012. In comparison, in the United States in 2012, 48% of private-sector employees were active participants in a workplace pension plan (Bureau of Labor Statistics, 2012).

This led to concerns that undersaving for retirement was widespread. In response, automatic enrolment into workplace pensions was introduced as part of a package of reforms designed to boost the adequacy of retirement saving (which also included a move from price to

earnings indexation of the state pension to be partially paid for by future increases in the state pension age; see Pensions Commission, 2005).

Details of automatic enrolment

Under automatic enrolment, employers must enrol all their targeted employees into a pension plan, which employees are then able to choose to leave at any point. Certain conditions must be met for employees to be 'targeted' for automatic enrolment:[3] they must be aged at least 22, they must be aged below the state pension age, they must have worked for their employer for at least three months, and they must earn more than a given earnings level. Since April 2014, this earnings level has been set equivalent to £10,000 ($13,000) per year.

Employers must automatically enrol all of their targeted employees into a pension plan with (at least) minimum levels of contributions. Up to and including March 2018, the minimum employer contribution was 1% of qualifying earnings and the minimum total contribution was 2% of qualifying earnings, where the 'total' is the sum of employee and employer contributions, including any tax relief. In 2016–17, qualifying earnings were those between £5,824 ($7,600) and £43,000 ($55,900) per year.[4]

The obligation of employers to enrol their targeted employees automatically has been introduced gradually since October 2012. Each employer is given a 'staging date' from which they must automatically enrol targeted employees, although they can (but do not have to) postpone enrolment by up to three months. This means that any employer at least three

[3] In the UK government's terminology, targeted employees are known as 'eligible' employees. This is a bit of a misnomer, as eligible employees are those who must be automatically enrolled, while ineligible employees can be automatically enrolled, but do not have to be.

[4] Minimum total contributions rose to 5% of qualifying earnings from April 2018 (with a minimum of 2% from the employer) and will rise to 8% from April 2019 (with a minimum of 3% from the employer). Employers can choose to enrol their employees automatically into plans with higher (employee and/or employer) contributions, although they are prevented from setting the employee contribution rate so high as to deliberately encourage a large proportion of employees to opt out.

months past their staging date must have introduced automatic enrolment otherwise they will be in breach of their legal obligations.

An employer's staging date is determined by information on its Pay-As-You-Earn (PAYE) tax scheme (the scheme by which income and payroll taxes are withheld from employees' earnings), specifically the number of employees as of April 2012 and, for some smaller employers, the last two digits of the employer's PAYE code. Those employing 120,000 or more employees were the first employers to be affected, with a staging date of 1 October 2012. Gradually, the obligation to enrol targeted employees automatically was rolled out to affect progressively smaller employers. By 1 April 2015, all employers with more than 50 employees had passed their staging date, and between 1 June 2015 and 1 October 2015, employers of between 30 and 49 employees reached their staging date.

For employers with 29 or fewer employees, staging dates were allocated gradually – from 1 June 2015 to 1 April 2017 – according to the last two digits of the employer's PAYE code (see Table A1 in the Appendix for the exact details). Finally, staging dates between 1 May 2017 and 1 February 2018 were allocated to those employers who were new since April 2012.

There are groups of employees whom employers do not have to enrol automatically into a pension plan, but who are nonetheless potentially affected by automatic enrolment. Employees earning over the earnings threshold, but aged 16–21 or over the state pension age (but under 75), as well as those aged 16–74 earning between £5,824 ($7,600) and £10,000 ($13,000) per year (in 2016–17) do not have to be enrolled automatically; however, they can opt in to join the plan, and both employers and employees must make at least minimum contributions. Employees earning below £5,824 ($7,600) per year (in 2016–17) also do not have to be enrolled automatically but can choose to join a workplace pension plan, although

for this group their employer does not have to make a contribution. As with automatic enrolment, employers can postpone enrolment through these 'opt-in' routes by up to three months.

3. Data and empirical methodology

3.1. Data

The data used in this paper are from the Annual Survey of Hours and Earnings (ASHE). This is a panel survey collected by the UK's Office for National Statistics (2017). Employees are included in the survey if their National Insurance number ends in a specific pair of digits. Therefore, it can be used to follow the same individuals over time and it contains approximately 1% of employees in Britain. The survey began in 1997 is completed by employers in April of each year. The number of responses to this survey is around 180,000 in each year.[5]

The ASHE data include detailed information on the pay and hours of work of each employee and the survey asks the employer whether the employee participated in a workplace pension plan ('run or facilitated by [the] organisation'). From 2004 onwards, it also asks how much the employer and the employee contributed to the pension. The data contain some information on the employee, such as age, sex, occupation and job tenure, and on the employer, such as industry and sector. Most importantly, the data contain the number of employees who worked for the employer in each year they are included in the data.[6] Therefore, we can define the set of individuals who are 'targeted' for automatic enrolment: those aged between 22 and the state pension age, those earning more than the automatic

[5] In 2007 and 2008, the Office for National Statistics cut the sample size (non-randomly) by approximately 20%. The full sample was restored in 2009 and therefore we restrict our use of these data to the period from 2009 onwards.

[6] For a small number of employers, we match information on their numbers of employees from the Annual Business Survey (see Office for National Statistics, 2018a) if data on employer size in 2012 are not available in the ASHE but are available in the Annual Business Survey.

enrolment earnings threshold and those who have been working for their employer for at least three months. As public-sector workers are typically offered very different (defined benefit) pension plans, and had much higher participation rates prior to automatic enrolment, we focus entirely on employees of private-sector organisations in this paper.

For one year of ASHE data only (2016), the UK's Office for National Statistics has kindly merged into the data the last two digits of the employers' PAYE code – a variable that is not routinely in the data made available to researchers or analysts. This allows us to determine which employers of between 2 and 29 employees have introduced automatic enrolment in April 2016 and which have not, given the rules of the rollout set out in Section 2.[7]

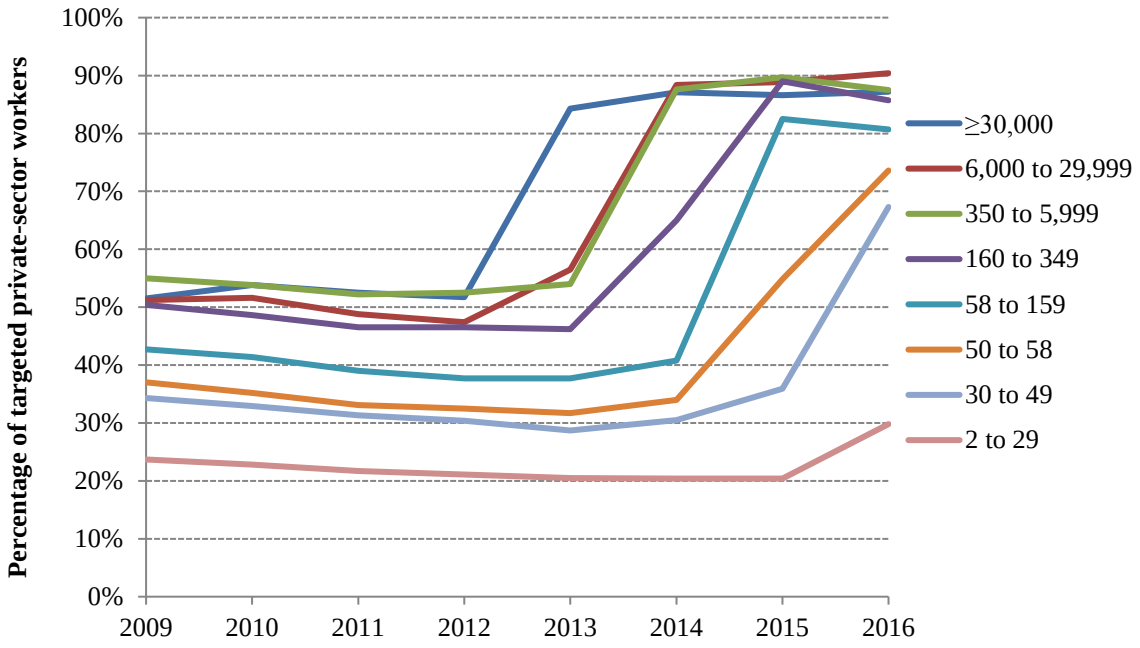
Figure 1 show the trends in workplace pension participation, over the period since 2009 and by size of employer, among private-sector employees who would be targeted for automatic enrolment if it were in place. Prior to 2012, participation rates were greater among employees working for larger employers than smaller employers, but they had generally been declining over time. Then, over the period to April 2016, workplace pension participation rises around the point where automatic enrolment is introduced. These data – and the variation created by the fact that automatic enrolment was applied gradually from larger to smaller employers – were used by Cribb and Emmerson (2016), who found that automatic enrolment increased workplace pension participation among employees working for large and medium-sized employers by 37 ppts to reach 88% in 2015.

In this paper, we are interested in the effect on the smallest employers (those with between 2 and 29 employees in 2012). The bottom line on the graph shows that there were gradual falls in pension participation from 24% to 20% for this group between 2009 and 2015. Only in

[7] Employees working for an employer with only one employee are excluded, as those who are sole-director of their own company and who employ themselves are not obliged to enrol themselves automatically into a workplace pension and these cases will comprise a significant share of employers with just one employee.

2016, as some (but not all) of these employers had to introduce automatic enrolment, pension participation increased to 30%.

Figure 1. Workplace pension participation rates among private-sector employees targeted for automatic enrolment, by employer size in 2012



Source: Authors' calculations using data from the ASHE.

3.2. Empirical methodology

As discussed in Section 2, for employers with between 2 and 29 employees in 2012, automatic enrolment is introduced gradually, based on the last two digits of their government-assigned PAYE tax number. This creates pseudo-random variation in whether employers (and their employees) have had automatic enrolment introduced at the point the ASHE observes them in April 2016.

This pseudo-random variation allows us to compare pension outcomes among employees of small employers who were subject to automatic enrolment (our treatment group), with those observed among employees of otherwise similar small employers who were not subject to automatic enrolment (our control group). Because treatment (i.e. being automatically

enrolled) in April 2016 is (pseudo-randomly) assigned based on the last two digits of employers' PAYE numbers, we can use the control group as a counterfactual for the treatment group had automatic enrolment not been introduced.

Therefore, we define our treatment group as targeted employees working for employers with between 2 and 29 employees (in 2012) whose staging date was between 1 June 2015 and 1 November 2015.[8] All of these employees would have been more than three months past their staging date by April 2016, and therefore subject to automatic enrolment. Our control group is defined as targeted employees working for employers with between 2 and 29 employees (in 2012) who passed their staging date on or after 1 May 2016. This is because none of these employers would have been past their staging date in April 2016 when the ASHE survey was undertaken.[9] More details on the timing of staging dates for small employers are provided in Table A1 in the Appendix.

Having defined our treatment and control groups, equation (1) sets out the specification that we use to estimate the impact of automatic enrolment on pension outcomes:

$$(1) \quad y_i = \alpha + \beta autoenrolled_i + \delta X_i + \varepsilon_i.$$

We want to estimate the effect of automatic enrolment on an outcome (such as pension participation) y, for an employee i. The variable $autoenrolled_i$ is a dummy variable taking the value of 1 if automatic enrolment was in place (the treatment group) and 0 if it was not in place (the control group). β is our coefficient of interest. We run specifications with and

[8] We also exclude (from treatment and control groups) any employers that had 100 or more employees in April 2016. This is because we want to focus on small employers, and so do not want our results to be affected by a small number of unusual employers that have seen strong employment growth since 2012.

[9] There are two groups of targeted employees working for employers with between 2 and 29 employees that we do not include in either the treatment group or the control group. First, those with staging dates between 1 February and 1 April 2016 were not three months past their staging date when the ASHE survey was undertaken in April 2016, so we do not know if automatic enrolment had been introduced by then. Second, those who had a staging date of 1 January 2016 will have only just reached the point three months past the staging date in April 2016. Thus, these are excluded as any small delay of a few days in compliance with the obligations would bias our estimates of participation for those who are automatically enrolled.

without controls for a vector of characteristics of employees and the employers they work for, X. These controls are for gender, age (quadratic), gross weekly earnings (quadratic), job tenure (linearly and three dummies), weekly hours of work (four dummies), number of employees in 2012, number of employees in 2016, 14 dummies for industry of the employer and eight dummies for occupational category of the employee. The full list of covariates can be found in Table A2 in the Appendix.

The primary outcomes of interest are the effects of automatic enrolment on the probability of participation of a workplace pension plan and on the level and distribution of contributions. Using ordinary least squares (OLS), we estimate the effect on the probability of participation in a workplace pension plan and, for employer, employee and total pension contributions, we look at the effect on the probability of contributing more than several different thresholds.

Because automatic enrolment is implemented by employers, and they may implement it in slightly different ways (particularly in terms of how much they offer as an employer contribution), there may be a correlation in the error ε_i between employees working for the same employer. In all our results, therefore, we cluster our standard errors at the employer level, though in practice this makes little difference as these are all small employers; with a 1% sample of employees, each employer typically only appears in our data once in 2016.

Our key identifying assumption is that, absent automatic enrolment being introduced, the pension outcomes of employees working for employers with between 2 and 29 employees would not vary by the last two digits of the employers' PAYE tax code. Therefore, a concern could arise if these codes were allocated in some systematic way that is correlated with pension outcomes. Unfortunately, in the earlier years of data we do not observe the last two digits of the employers' PAYE code and therefore we cannot conduct placebo tests to see if pension outcomes were different between the two groups in earlier years before automatic

enrolment was introduced.[10] However, we can document the extent to which the characteristics observed in our data of the employees and employers in our treatment and control groups differ. This is shown in Table 1.

Table 1. Comparison of average characteristics of employees working for private-sector employers with between 2 and 29 employees in April 2012, by treatment and control group

	Treatment group	Control group	Difference
Employee characteristics			
Male	0.584	0.576	0.008
Gross earnings (£ per week)	487	480	6
Total paid hours per week	37.4	37.2	0.1
Job tenure (years with employer)	7.7	6.5	1.3**
Age	42.5	40.9	1.5
High occupational class	0.368	0.369	–0.001
Mid occupational class	0.402	0.41	–0.008
Employer characteristics			
Number of employees in 2012	13.7	13.3	0.3
Number of employees in 2016	15.8	15.0	0.8
Industry: Manufacturing	0.151	0.116	0.035
Industry: Retail	0.192	0.199	–0.007
Industry: Administrative	0.103	0.066	0.037
Industry: Health/social care	0.131	0.106	0.025
Number of observations	291	13,942	N/A

Notes: All averages are means. ***, ** and * denote that the effect is significantly different from zero at the 1%,5% and 10% levels, respectively. The *p*-values are adjusted for multiple hypotheses testing using the stepdown procedure described in Romano and Wolf (2005, 2016), implemented using the STATA program rwolf.
Source: Authors' calculations using the ASHE.

For almost all characteristics we find no evidence of statistically significant differences in average characteristics between our treatment and control groups. More importantly, in no case is the difference observed in our sample economically large enough to drive a substantially different pension outcome. For example, the difference in mean weekly earnings between our treatment and control groups is just £6 and is not statistically different from zero.

[10] One possibility would have been to link employers over time. However, small employers can only be in our data if they have an employee with a National Insurance number ending in a certain two digits. This leads to a lot of churn among the small employers included in our data from one year to the next, making this approach not possible in practice.

The only difference that is statistically significant is the average job tenure; employees working for the treated employers have slightly longer job tenure (1.3 years). Although there is a slight difference in this variable, when we control for these observed differences our findings are not materially affected. This leads us to conclude that there are not any important differences in the observed characteristics between treatment and control groups. This also helps to justify our assumption that there are also not any important differences in unobserved characteristics between the groups that would drive differences in workplace pension saving.

4. Results

4.1. The effect of automatic enrolment on pension participation

Table 2 presents our estimates of the effect of automatic enrolment on workplace pension participation among employees working for smaller employers. The first specification shows that among targeted employees, the workplace pension participation rate was 70.1% in our treatment group compared with just 23.2% in our control group. This gives a raw difference of 46.9 ppts. The inclusion of our control variables (gender, age, gross weekly earnings, hours of work, job tenure, employer size in 2012 and 2016, industry and occupation) makes little difference to the estimated impact, as shown by specification 2 of Table 2, suggesting that automatic enrolment increased workplace pension participation by 44.0 ppts. This is our preferred estimate of the impact of automatic enrolment on pension participation.

One potential concern with our approach is that our control group could be contaminated by employers choosing to introduce automatic enrolment early. For example, some smaller employers with later staging dates could have decided to implement automatic enrolment a few months early in order to attract and retain employees who might otherwise work for similar employers who had already reached their staging date.

Table 2. Effect of automatic enrolment on private-sector pension participation using different methods (for employees of employers with between 2 and 29 employees in April 2012)

Specification number and description	Effect of automatic enrolment	Standard error	Sample size	Unadjusted pension participation in:	
				Control group	Treatment group
Main specification					
(1) Without controls	0.469***	[0.028]	14,756	23.2%	70.1%
(2) With controls	0.440***	[0.027]	14,756	23.2%	70.1%
Alternative specification					
(3) Without controls	0.503***	[0.028]	17,633	19.8%	70.1%
(4) With controls	0.476***	[0.027]	17,633	19.8%	70.1%

Notes: ***, ** and * denote that the effect is significantly different from zero at the 1%, 5% and 10% levels, respectively. Standard errors are clustered at the employer level. Results are from estimating equation (1) by OLS. Full list of controls is given in Table A2. Main and alternative specifications are outlined in the text.
Source: Authors' calculations using the ASHE.

To test this, we compare targeted employees in our treatment group with those in a different control group. For this alternative control group, we take all targeted employees working for employers with between 2 and 29 employees in April 2015 (i.e. several months before any of them would reach their staging date). As shown in Figure 1, there is no evidence of any unusual change in workplace pension participation among this group at that point in time, and therefore no need to use employees in 2014, or earlier, as an alternative control group.

Workplace pension participation among this alternative control group is lower than in the contemporaneous control group. If anything, this suggests that automatic enrolment may have had a larger impact on pension participation than our main specification suggests. Without controls (specification 3) we find a 50.3 ppts impact of automatic enrolment, while with controls (specification 4) this drops slightly to 47.6 ppts. Overall, the use of this alternative control group would not change our conclusion that automatic enrolment boosted pension participation among this group by around 45 ppts.

Overall, we find that 70% of targeted employees working for employers with between 2 and 29 employees participate in workplace pensions once automatic enrolment is in place. This rate is much lower than has been seen elsewhere in the literature. Cribb and Emmerson (2016) found participation of around 88% for targeted employees working for employers with 58 or more employees in the UK, which is similar to the participation rates seen among the large companies studied in Madrian and Shea (2001). Choi et al. (2004) and Beshears et al. (2009) also find that medium-sized and large companies in the United States with automatic enrolment have pension participation rates in excess of 90%. Our findings imply that, while the boost to pension participation is still extremely large, automatic enrolment for employees of small employers leads to many fewer people participating than when automatic enrolment is introduced by large employers.

It is also interesting to examine whether automatic enrolment by small employers has heterogeneous impacts on different types of employees. Therefore, we apply our preferred specification (specification 2 of Table 2) to different subsets of targeted employees to test for evidence of variation in the impact of automatic enrolment on workplace pension participation.

Among all the groups we examine, automatic enrolment increases pension participation substantially. Moreover, in all cases the point estimates suggest a larger impact on the subgroup with lower pension participation among our control group (men, lower earners, younger employees and those with shorter job tenures). There was no evidence of a statistically significant differential impact by either sex or earnings. However, we do find evidence of automatic enrolment leading to larger increases in workplace pension participation among younger employees than older employees, and among those with shorter job tenures than those with longer job tenures. In the case of age, the size of the difference in the impact of automatic enrolment is sufficient to reverse the pattern of pension coverage by

age: in the treated group, pension membership for those aged 22–39 is greater than for those aged between 40 and the state pension age. In none of the subgroups does pension participation reach the very high overall rates (ca. 90%) seen among employees working for larger employers once automatic enrolment is in place.

Table 3. Effect of automatic enrolment on pension participation of subgroups working for small employers (with between 2 and 29 employees in April 2012)

	Effect of automatic enrolment	Standard error	Sample size	Unadjusted pension participation rates in:	
				Control group	Treatment group
All	0.440***	[0.027]	14,756	23.2%	70.1%
Sex					
Male	0.444***	[0.036]	8,201	21.2%	68.2%
Female	0.433***	[0.039]	6,032	25.9%	72.7%
Earnings					
<£350 per week	0.457***	[0.047]	4,988	15.8%	65.0%
£350 to £500 per week	0.437***	[0.049]	4,285	20.8%	67.4%
£500+ per week	0.420***	[0.043]	4,960	32.6%	77.8%
Age group					
Age 22-39	0.543***	[0.039] †††	6,712	19.3%	74.6%
Age 40-state pension age	0.358***	[0.036] †††	7,521	26.6%	66.7%
Years with employer					
Fewer than four years	0.491***	[0.040] †††	6,903	18.6%	68.4%
Four years or more	0.396***	[0.036] †††	7,330	27.5%	71.5%
Not targeted for automatic enrolment					
All	0.139***	[0.029]	8,400	6.8%	20.9%

Notes: Effects are from estimating equation (1) by OLS with control variables as set out in Table A2. ***, ** and * denote that the effect is significantly different from zero at the 1%, 5% and 10% levels, respectively. Standard errors are clustered at the employer level. †††, †† and † signify that the effect of automatic enrolment on one subgroup is statistically different to the effect for the other group at the 1%, 5% and 10% levels, respectively.
Source: Authors' calculations using the ASHE.

We are also able to test whether automatic enrolment affects pension participation among non-targeted employees (i.e. employees who have not yet been with their employer for three months, or are young, or too old, or earn too little to be targeted). There could be impacts on the pension participation of the non-targeted employees for three potential reasons, although

our data and methodology do not allow us to test which reason is most important. First, employers could choose to enrol these individuals automatically. Second, as a result of other employees being automatically enrolled, these employees could be choosing to actively join. Third, employers automatically enrol employees when they are targeted and employees could continue to participate even if they are no longer formally targeted (e.g. if their earnings dip below the earnings threshold). Among the non-targeted employees, we find a sizeable 13.9 ppt increase in workplace pension participation as a result of automatic enrolment. This is a slightly smaller magnitude than the 17.8 ppt increase in pension participation among non-targeted employees of larger employers as a result of automatic enrolment found by Cribb and Emmerson (2016).

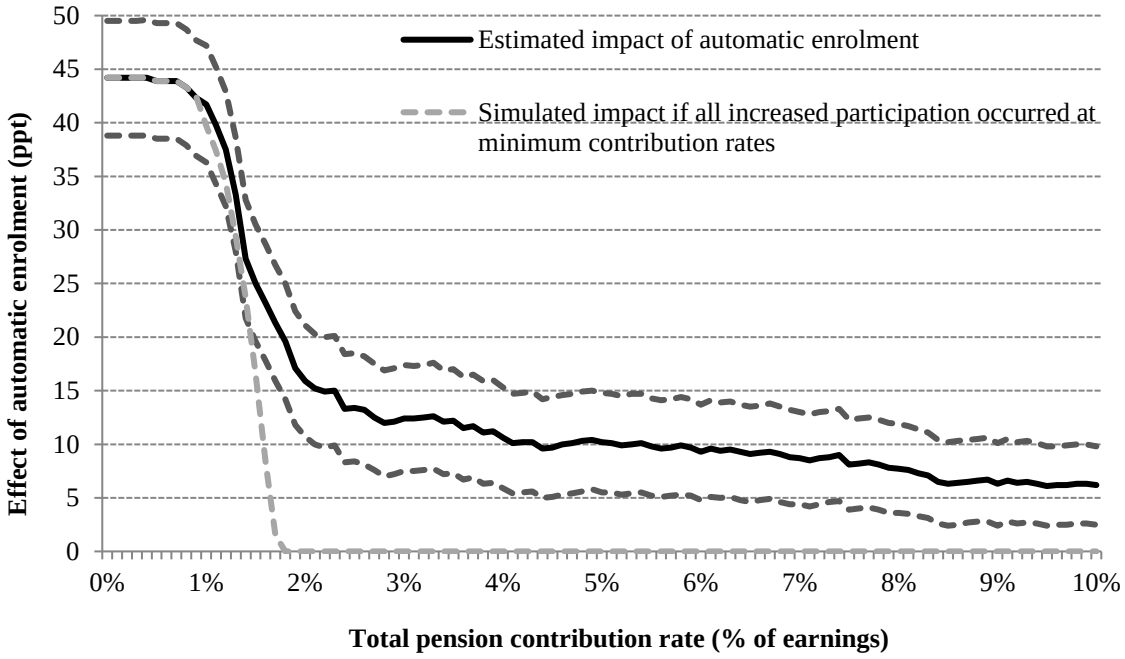
4.2. The effect of automatic enrolment on the distribution of pension contributions

Ultimately the adequacy of retirement saving will depend on how much is saved. Therefore, we now turn to look at the impact of automatic enrolment on pension contributions. Specifically, we look at the total contributions made to the pension plan (i.e. the sum of contributions made by the employee and the employer) measured as a share of earnings. We then run a set of OLS regressions to see whether once automatic enrolment is in place, targeted employees in the treatment group are more likely than those in the control group to have a pension contribution worth more than different thresholds. Specifically, we look at the likelihood of receiving a pension contribution of more than 0% of earnings, then more than 0.1% of earnings, then more than 0.2% of earnings, right up to more than 10.0% of earnings (i.e. a total of 101 separate regressions).

The results of this exercise, presented in Figure 2, show that the majority of targeted employees brought into workplace pensions by automatic enrolment are making relatively low levels of contributions, focused on the default minimum (which, in April 2016, was 2% of ‘qualifying’ earnings). This is shown by the 44 ppts increase in the probability of making

contributions of more than 0.5% of earnings, but only a 16 ppts increase in the likelihood of making contributions of more than 2% of earnings.

Figure 2. Effect of automatic enrolment on probability of total contribution rate being greater than certain percentages of earnings, for targeted employees of small employers (with between 2 and 29 employees)



Notes: Each of the data points (at each 0.1% of earnings) is the coefficient on automatic enrolment from estimating equation (1) where the dependent variable is a dummy indicating if the contribution rate is in excess of the specified amount. Each regression is estimated by OLS including control variables (*X*, listed in Table A2). Standard errors are clustered at the employer level and used to construct the 95% confidence intervals shown by dotted lines. The grey dashed line shows the simulated impact on contribution rates had the entire increase in pension participation occurred at the minimum default contribution rates and had no one else changed their pension saving in response to the reform.
Source: Authors' calculations using the ASHE.

However, we also find evidence that the proportion brought in at significantly higher rates of contributions has also increased as a direct result of automatic enrolment. For example, the proportion of targeted employees contributing more than 5% of their earnings to a workplace pension is increased by 10.2 ppts, while the proportion contributing more than 10% of earnings is increased by 6.2 ppts. All of these effects are statistically different from zero, at least at the 5% level.

As a comparison, the grey dashed line in Figure 2 shows the simulated impact of automatic enrolment on the probability that total pension contributions are in excess of different

amounts, assuming that every employee enrolled in a pension plan as a result of automatic enrolment (specifically the 44.0% of employees shown in Table 2) was enrolled with only the minimum default contributions. By comparing the estimated impact of automatic enrolment (the solid black line) with this simulated effect, we can see that if only the minimum contributions were made, there would be no effect on the probability of having contributions in excess of 2% of salary.

Figures A1 and A2 in the Appendix show that this effect is a result of employees having both higher employee contributions and higher employer contributions than the government's minimum defaults. This finding is similar – and, if anything, more apparent – than the equivalent among medium-sized and large employers in the United Kingdom reported by Cribb and Emmerson (2016), who also found that there were significant increases in the probability of having contributions in excess of the minimums.

4.3. Differences in pension participation by employer size under automatic enrolment

It is clear from these results, even with automatic enrolment in place, that employees of smaller employers are significantly less likely to participate in a pension plan than employees of larger employers. This is shown in particular detail in Table 4, which looks at private-sector employers that have introduced automatic enrolment. The final column shows the workplace pension participation rate by employer size, for targeted employees in April 2016. (Note that this table measures pension participation by employer size in 2016, whereas the results so far have focused on those employers who had between 2 and 29 employees in 2012.) The table shows that for employers with 500 or more employees, pension participation is between 87% and 90%. However, for employers with fewer than 100 employees, pension participation is much lower, and it is, in particular, substantially lower for those with fewer than 25 employees. Specification 1 of Table 4 presents the differences in pension

participation rates among employees of different sized employers, relative to those working for the largest employers. It confirms that it is among those working for employers with fewer than 100 employees that the differences in pension participation rates are significantly different. We can test some hypotheses as to why – even under automatic enrolment – pension participation is lower among smaller employers than among large employers.

Table 4. Differences in pension participation for employees targeted for automatic enrolment working for private-sector employers who have introduced it (April 2016)

	Specification 1		Specification 2		Pension participation rate
	Coefficient	Std error	Coefficient	Std error	
Number of employees					
≥10,000	Baseline group		Baseline group		88.3%
5,000–9,999	0.025	[0.031]	–0.003	[0.024]	90.8%
1,000–4,999	–0.014	[0.030]	–0.033	[0.024]	86.9%
500–999	–0.006	[0.030]	–0.024	[0.023]	87.8%
250–499	–0.019	[0.029]	–0.034	[0.023]	86.5%
100–249	–0.041	[0.029]	–0.052**	[0.023]	84.2%
50–99	–0.117***	[0.029]	–0.122***	[0.024]	76.7%
25–49	–0.217***	[0.030]	–0.218***	[0.025]	66.7%
2–24	–0.257***	[0.038]	–0.248***	[0.034]	62.6%
Controls included	No		Yes		
Number of observations	76,419		76,419		
Number of clusters	21,708		21,708		

Notes: The sample is private-sector employees who are targeted for automatic enrolment and work for employers where automatic enrolment has been introduced. Employer size is measured in April 2016. Results are from regressions with pension participation as the dependent variable, and eight dummies for employer size as the dependent variables, estimated by OLS. Specification 2 includes control variables for gender, age (quadratic), gross weekly earnings (quadratic), hours of work (four dummy variables), job tenure (three dummy variables and linearly), industry (14 dummy variables) and occupation (eight dummy variables). Standard errors are clustered at the employer level. ***, ** and * denote that the effect is significantly different from zero at the 1%, 5% and 10% levels, respectively.
Source: Authors' calculations using the ASHE.

As set out in Section 1, one reason that those working for smaller employers may have lower pension participation rates is that the types of people working for smaller employers are systematically different. For example, it is well known that smaller employers pay less, on average, than larger employers (Bloom et al., 2018). In specification 2 of Table 4, therefore, we control for the differences in the set of characteristics observed in the ASHE (sex, age, gross weekly earnings, hours of work, job tenure, industry and occupation). The results show

that – once automatic enrolment is in place – none of the differences in the pension participation rates between employees of larger and smaller employers is driven by these observed factors.

Of course, we cannot rule out that there are no unobserved characteristics that vary between the employees of smaller and larger employers that are important in driving retirement savings and pension participation, such as different levels of self-control (see Laibson et al., 1998) or locus of control (Cobb-Clark et al., 2016). However, given that the differences in earnings, industry and occupation, etc., do not play a noticeable role, it would be surprising if unobserved factors were important in driving the differences in the rates of pension participation.

Another reason for lower participation in workplace pensions could be less generous employer contribution offers from smaller employers than from larger employers. Figure 3 shows the distribution of employer pension contributions for those participating in a workplace pension plan, for employees working for employers of 2–49, 50–499 and 500 or more employees. It shows that 41% of pension participants working for the smallest employers receive at most 1% of earnings as an employer contribution, compared with 30% of those whose employers employ at least 500 employees. At the other end of the spectrum, only 10% those working for small employers receive an employer pension contribution exceeding 10% of earnings, compared with 26% for those working for large employers. Therefore, small employers are giving employees who participate in workplace pension plans substantially lower contributions than larger employers.[11]

[11]If anything, Figure 3 will likely underestimate the difference in *offers* of employer pension contributions, as fewer employees of small employers participate in workplace pensions and those who do participate will, if anything, be likely to be disproportionately selected from those employers who make more generous offers.

Figure 3. Distribution of employer pension contributions for private-sector employees participating in a workplace pension plan after automatic enrolment, by employer size in 2016

Notes: For each band (most importantly, 0% to 1%), employees are included in the band if their contribution rate is strictly greater than the lower amount and weakly less than the upper amount. Restricted to those targeted for automatic enrolment.
Source: Authors' calculations using the ASHE.

Figure 4. Distribution of employee pension contributions for private-sector employees participating in a workplace pension plan after automatic enrolment, by employer size in 2016

Notes: Restricted to those targeted for automatic enrolment.
Source: Authors' calculations using the ASHE.

More generous employer pension contributions from larger employers could potentially rationalise some of the differences in participation rates between large and small employers. For example, previous evidence from Beshears et al. (2010), found that under automatic enrolment, offering an employer match of 50% (up to a cap of 6% of salary) increased pension plan participation rates by between 5 and 11 ppts.

However, if employees of larger employers have to make (potentially) significant employee contributions in order to receive the employer contributions – as is the case in many Defined Benefit plans and some Defined Contribution plans – this potential channel might be weaker than it would otherwise be. Figure 4 is the counterpart to Figure 3, showing the distribution of *employee* contributions of those enrolled in a pension plan. It shows that enrolled employees working for large employers are significantly more likely to make higher employee contributions than their counterparts working for small employers.

While higher employer offers would be likely to encourage pension participation, higher employee contributions might depress participation, as employees may not want to give up more current consumption to save for retirement. Without detailed employer-level data on the offers of contributions and pension participation rates within them, it is hard to assess definitively the extent to which these differences in employer and employee contributions across small and large employers can explain varying pension participation.

However, using only data on large employers in the ASHE, we can relate the employer-level average employee and employer contributions to individual pension participation decisions under automatic enrolment. In the analysis in Table 5, we take a sample of almost 19,000 targeted employees in 2016 who work for 134 large private-sector employers that employ at least 5,000 employees (and for whom there are at least 50 observations in the data in 2016). For each employee, we calculate the average employer and employee contribution rates

among the other targeted workers working for their employer who are enrolled in a pension plan and are observed in our data. This provides us with a proxy for the offer – in terms of employer and employee contributions – that the employee receives from their employer. We then discretise these variables: with five bands for employer contributions and four bands for employee contributions.

Table 5. Differences in pension participation for employees targeted for automatic enrolment working for private-sector employers who have introduced it, April 2016

Average contribution rate of the employee's employer	Specification 1		Specification 2	
	Coefficient	Std error	Coefficient	Std error
Employer: 0% to 1%	Baseline group		Baseline group	
Employer: 1% to 2%	0.039	[0.035]	0.034	[0.041]
Employer: 2% to 5%	0.055	[0.037]	0.049	[0.052]
Employer: 5% to 10%	0.100***	[0.028]	0.039	[0.045]
Employer: 10% plus	0.152***	[0.042]	0.084	[0.053]
Employee: 0% to 1%	Baseline group		Baseline group	
Employee: 1% to 2%	0.013	[0.027]	–0.009	[0.034]
Employee: 2% to 5%	–0.032	[0.026]	–0.071*	[0.037]
Employee: 5% plus	–0.079	[0.059]	–0.103*	[0.056]
Controlling for other characteristics	No		Yes	
Number of observations	18,820		18,820	
Number of clusters	134		134	

Notes: The sample is private-sector employees who are targeted for automatic enrolment and work for employers where automatic enrolment has been introduced. Results are from regressions with pension participation as the dependent variable, and dummies for average contribution rates of targeted employees in their employer (excluding the individual themselves in the calculation), estimated by OLS. Specification 2 includes control variables for gender, age (quadratic), gross weekly earnings (quadratic), hours of work (four dummy variables), job tenure (three dummy variables and linearly), industry (14 dummy variables) and occupation (eight dummy variables). Standard errors are clustered at the employer level. ***, ** and * denote that the effect is significantly different from zero at the 1%, 5% and 10% levels, respectively.
Source: Authors' calculations using the ASHE.

With data at the employee level, we then regress a dummy for an individual's pension participation on these measures of the pension contribution offer. Specification 1 includes no other controls, and specification 2 controls for the same set of characteristics (age, sex, tenure, industry, earnings, etc.) that are used in the analysis in Table 4.

Although the standard errors are quite large (as there are only 134 employers in the data), the result shows a relationship in the expected direction: higher average employer contributions are associated with higher pension participation, and higher employee contributions are associated with lower levels of pension participation. The exact magnitude of the relationship differs depending on whether we control for other observed characteristics.

Our conclusion from the results in Table 5 is that – if the same relationship that is observed among the employees of large employers also holds for those working for smaller employers – the different offers of pension contributions cannot explain the very large gap in pension participation between large and small employers under automatic enrolment. Although small employers are more likely to offer lower contributions, often their employees also only have to make very low contributions themselves. More precisely, the size of the effects in Table 5 are not large enough to drive the differences in pension participation seen above, when there is only an 11 ppt gap between large and small employers in terms of the probability of receiving a very low (at most 1%) employer contribution. Our calculations using these results suggest that, at most, they explain 1.5 ppts of the 22 ppt different in pension participation between larger and smaller employers.

This analysis implies that neither the differences in the observed characteristics, nor the differences in offered pension contributions, are likely to drive the lower pension participation for small employers under automatic enrolment. There are a number of additional candidates for an explanation of the difference in pension participation rates. First, people who do not want to save for retirement could disproportionately select into working for smaller employers, in a way that we cannot currently observe. Second, small employers could undertake other actions that reduce the participation rate of their employees – for

example, by implicitly suggesting slightly higher pay on the understanding that employees opt out of their pension plan, thereby reducing the cost of running a small pension plan.

A final difference is that most large employers will have offered a pension plan to their employees before the introduction of automatic enrolment, though employees will often have had to sign up for it actively. In contrast, for many small employers, automatic enrolment means they have to provide a pension plan for the very first time. This may mean that small employers, and their (smaller) human resources functions, are less effective at communicating the benefits of saving in a workplace pension than are larger employers with established plans.

Moreover, peer effects could potentially be important (as shown in Duflo and Saez, 2002). Among large employers that already had established pension plans, previously enrolled employees could be important (or more effective) at explaining to their previously un-enrolled colleagues how workplace pension plans work. This would not be possible among employers that were organising a pension plan for the first time with the introduction of automatic enrolment, where levels of understanding or engagement with pensions may, consequently, be lower. Indeed, our analysis of the UK's Wealth and Assets Survey (Office for National Statistics, 2018b) suggests that, while employees' levels of trust in their employer to give advice about saving for retirement are very low, they are particularly low (only 12%) for those working for small employers (with fewer than 25 employees), compared to 20% for those working for employers with 500 or more employees.

5. Conclusion

With automatic enrolment increasingly being considered by governments looking to increase private retirement provision, it is important to understand its effects on smaller employers – who have typically not introduced automatic enrolment previously (either voluntarily or

because they have been obligated to do so), and whose employees typically have much lower rates of participation in pension plans.

By exploiting the pseudo-random timing – based on the last two digits of the employer's payroll tax code – of the obligation for small private-sector employers in the United Kingdom to enrol their employees automatically into a workplace pension plan, we find that automatic enrolment substantially boosts pension participation, by around 45 ppts, to reach around 70% participation among targeted employees. The boost in pension participation is largest for younger workers and those with shorter job tenure (groups that had lower pre-reform pension participation rates). We find that while most employees are automatically enrolled at low minimum default contributions, there are also significant increases in the proportion with pension contributions well in excess of the minimums. There are also significant increases in the proportion of employees who do not have to be automatically enrolled but who do participate in a workplace pension. Although we do not observe the saving behaviour of employees outside their workplace pensions, if the results of Chetty et al. (2014) are generisable (they find that most individuals are sufficiently 'passive' not to reduce their saving in other forms), then we can conclude that automatic enrolment does indeed increase overall saving.

The key puzzle of these results is why pension participation amongst the smallest private-sector employers has not reached the very levels of around 90% seen among medium-sized and larger employers both in the United Kingdom and the United States. In this paper, we have provided evidence that it is a result of neither the differences in the characteristics of employees, such as their earnings, age or job tenure, nor the (lower) contributions that smaller employers, on average, offer their employees compared with larger employers.

Appendix

Table A1. Staging dates for employers who at April 2012 had between 2 and 29 employees

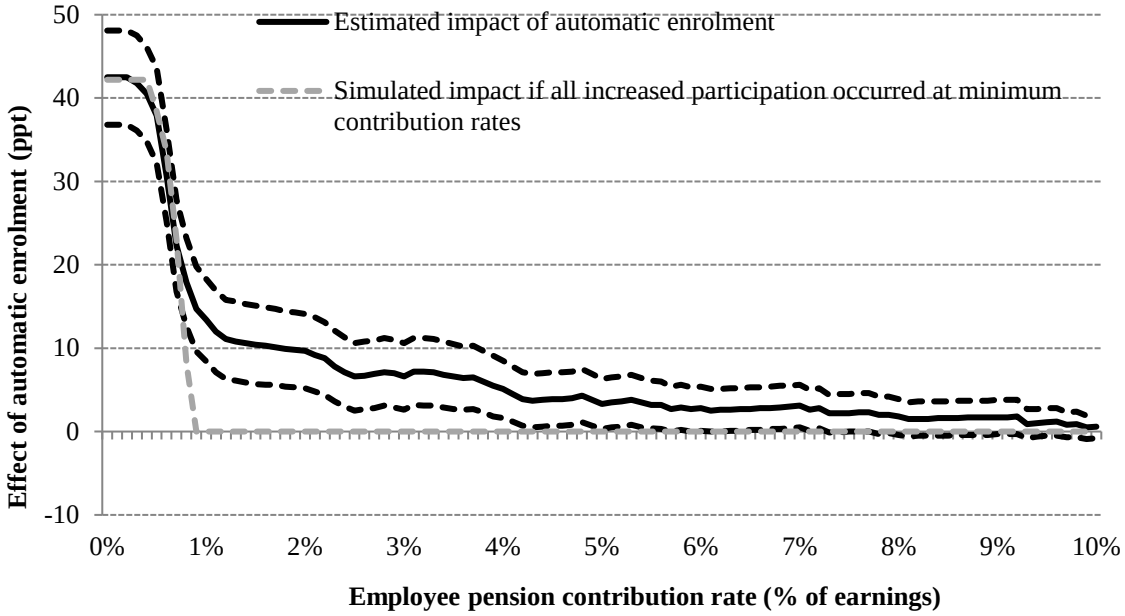
Final two digits of employers' PAYE reference number	Staging date
92, A1-A9, B1-B9, AA-AZ, BA-BW, M1-M9, MA-MZ, Z1-Z9, ZA-ZZ, 0A-0Z, 1A-1Z or 2A-2Z	1 June 2015
BX	1 July 2015
BY	1 September 2015
BZ	1 November 2015
02-04, C1-C9, D1-D9, CA-CZ or DA-DZ	1 January 2016
00 05-07, E1-E9 or EA-EZ	1 February 2016
01, 08-11, F1-F9, G1-G9, FA-FZ or GA-GZ	1 March 2016
12-16, 3A-3Z, H1-H9 or HA-HZ	1 April 2016
I1-I9 or IA-IZ	1 May 2016
17-22, 4A-4Z, J1-J9 or JA-JZ	1 June 2016
23-29, 5A-5Z, K1-K9 or KA-KZ	1 July 2016
30-37, 6A-6Z, L1-L9 or LA-LZ	1 August 2016
N1-N9 or NA-NZ	1 September 2016
38-46, 7A-7Z, O1-O9 or OA-OZ	1 October 2016
47-57, 8A-8Z, Q1-Q9, R1-R9, S1-S9, T1-T9, QA-QZ, RA-RZ, SA-SZ or TA-TZ	1 November 2016
58-69, 9A-9Z, U1-U9, V1-V9, W1-W9, UA-UZ, VA-VZ or WA-WZ	1 January 2017
70-83, X1-X9, Y1-Y9, XA-XZ or YA-YZ	1 February 2017
P1-P9 or PA-PZ	1 March 2017
84-91, 93-99	1 April 2017

Table A2. Effect of automatic enrolment on workplace pension participation among targeted employees of small employers: OLS regression results

Dependent variable: pension participation	Coefficient	Standard error
Automatic enrolment introduced by employer	0.440***	[0.027]
Male	–0.001	[0.009]
Gross earnings (£ per week)	0.001***	[0.000]
Gross earnings squared	0.000***	[0.000]
Hour worked: 16–29	0.059***	[0.014]
Hours worked: 30–39	0.031***	[0.011]
Hours worked: 40–49	–0.050***	[0.011]
Hours worked: 50+	–0.114***	[0.017]
Years with current employer	0.008***	[0.001]
Less than one year with current employer	–0.010	[0.010]
One to two years with current employer	0.004	[0.010]
No information on job tenure	–0.035*	[0.018]
Employer size in 2012	0.004***	[0.001]
Employer size in 2016	0.005***	[0.001]
Age	0.007***	[0.002]
Age squared	0.000***	[0.000]
Industry: Agriculture	–0.050*	[0.026]
Industry: Manufacturing	–0.060***	[0.019]
Industry: Construction	–0.123***	[0.019]
Industry: Retail and Wholesale	–0.072***	[0.018]
Industry: Transport and Storage	–0.087***	[0.024]
Industry: Accommodation and Food Services	–0.095***	[0.020]
Industry: Information and Communications	–0.083***	[0.023]
Industry: Finance or Insurance	0.075**	[0.033]
Industry: Real Estate	–0.083***	[0.028]
Industry: Scientific or Tech professions	–0.067***	[0.019]
Industry: Administration or support	–0.046**	[0.020]
Industry: Education	–0.002	[0.028]
Industry: Health/social care	0.135***	[0.019]
Industry: Arts and Recreation	–0.011	[0.032]
Occupation: Professional	0.041***	[0.016]
Occupation: Associate Professional	0.043***	[0.015]
Occupation: Admin/Secretarial	0.071***	[0.014]
Occupation: Skilled Trades	–0.031**	[0.013]
Occupation: Caring	–0.140***	[0.018]
Occupation: Sales/Customer Service	–0.017	[0.017]
Occupation: Plant and Processing	–0.038**	[0.016]
Occupation: Elementary occupations	–0.011	[0.015]
Constant	–0.257***	[0.049]

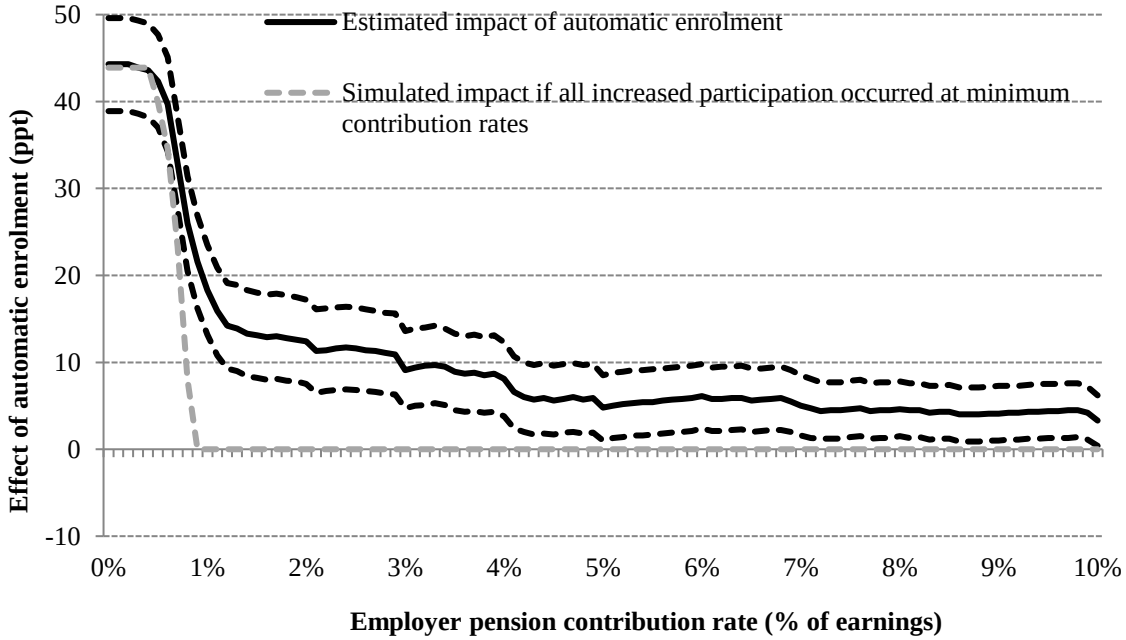
Notes: ***, ** and * denote that the effect is significantly different from zero at the 1%, 5% and 10% levels, respectively. Standard errors are clustered at the employer level. Results are from estimating equation (1) by OLS. Sample size: 14,756.
Source: Authors' calculations using the ASHE.

Figure A1. Effect of automatic enrolment on the probability of the employee contribution rate being greater than certain percentages of earnings, for targeted employees of small employers



Notes: Each of the data points (at each 0.1% of earnings) is the coefficient on automatic enrolment from estimating equation (1) where the dependent variable is a dummy indicating if the contribution rate is in excess of the specified amount. Each regression is estimated by OLS including control variables (*X*, listed in Table A2). Standard errors are clustered at the employer level and used to construct the 95% confidence intervals shown by dashed lines. The grey dashed line shows the simulated impact on contribution rates had the entire increase in pension participation occurred at the minimum default contribution rates and had no one else changed their pension saving in response to the reform.
Source: Authors' calculations using the ASHE.

Figure A2. Effect of automatic enrolment on the probability of the employer contribution rate being greater than certain percentages of earnings, for targeted employees of small employers



Notes and Source: See Notes and Source for Figure A1.

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