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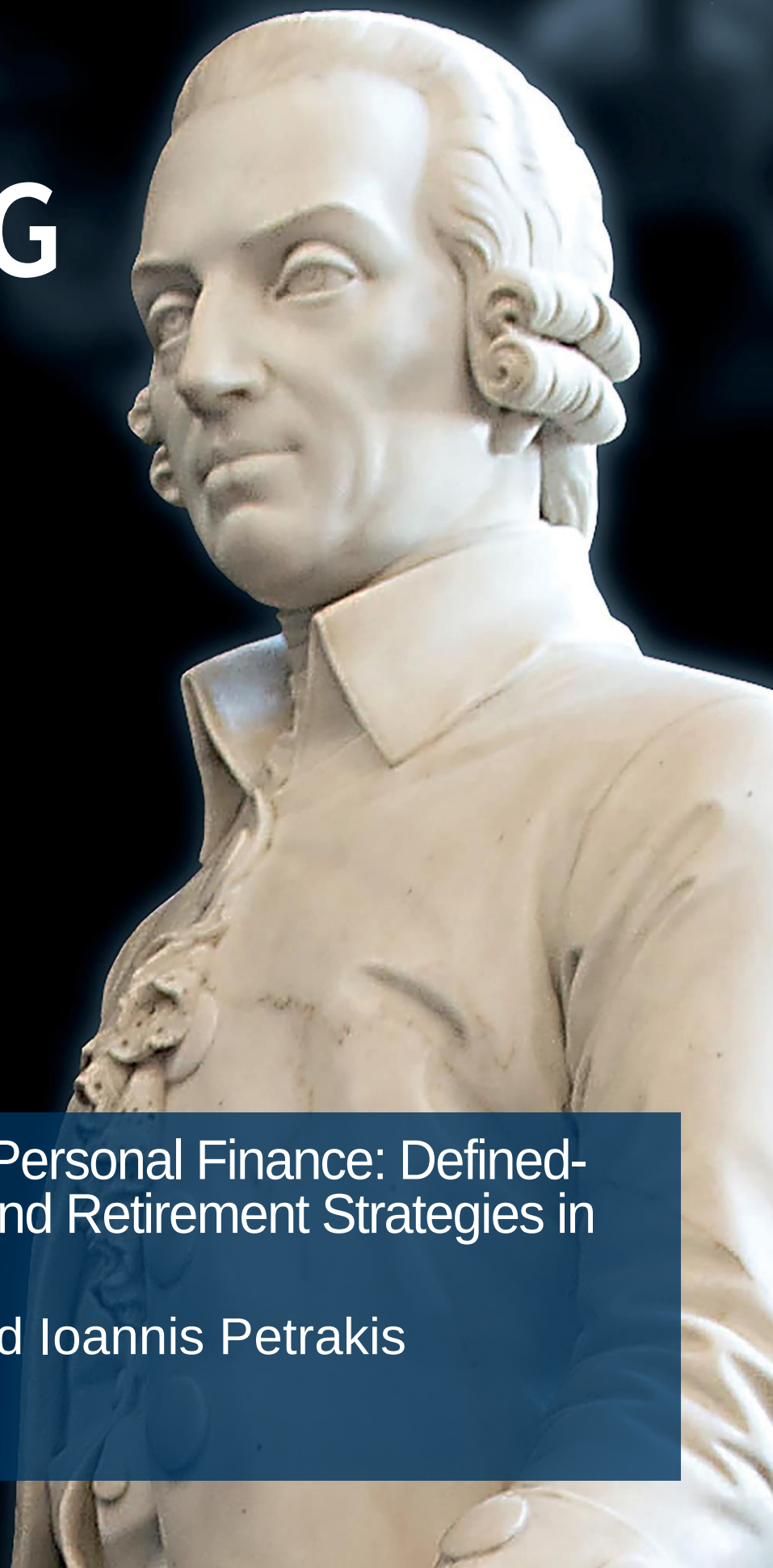

Pension Policy and Personal Finance: Defined-Contribution Plans and Retirement Strategies in the United Kingdom

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Abstract

This study examines the implications of the United Kingdom's 2012 pension auto-enrolment reform for retirement planning and capability. Utilising data from the 2018 Financial Capability Survey and applying an endogenous-treatment-effect methodology that also corrects for selection, we examine the impact of defined-contribution (DC) pension plan participation on personal financial management. The results identify significant changes in individual financial behaviours, including increased diversification of retirement income sources, enhanced household savings, stock investments, and real estate holdings among DC plan participants. Findings indicate that enhancing financial literacy and regulatory/information transparency and accessibility are critical for informed pension management. The study advocates for improved international accounting standards, robust auditing oversight, and harmonised tax policies to support informed retirement planning and financial resilience.

Keywords: Pension Accounting, Defined-Contribution Plans, Auto-Enrolment Policy, Financial Literacy, Information Transparency.

JEL Classification: D14, J32, G53, H55.

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1. Introduction

The increasing global life expectancy in a low interest-rate environment has raised significant concerns about the sustainability of pension systems. This challenge, compounded by recurring economic crises, has prompted many countries to adopt defined-contribution (hereafter DC) pension plans. Such plans aim to empower individuals to take a more active role in managing their retirement finances. Numerous studies emphasize the advantages of DC plans, including enhanced financial security and increased engagement in pension management (Card and Ransom, 2011; Benartzi and Thaler, 2013; Mitchell and Utkus, 2022).

Modern pension systems play a pivotal role in ensuring financial security during retirement. DC pension systems have gained popularity due to their ability to equitably distribute investment risks between employers and employees, promoting individual responsibility and flexibility in retirement planning. However, DC pension systems also pose notable disadvantages, primarily concerning individual financial security. The responsibility for retirement outcomes shifts significantly to individuals, who often lack sufficient financial knowledge, increasing their vulnerability to market fluctuations and poor investment decisions.

Indeed, Lusardi et al. (2017) highlight that financial knowledge accounts for up to 35% of retirement wealth inequality among older Americans. Limited financial literacy frequently translates into inadequate savings for retirement, posing serious risks to financial security in old age. Demirgüç-Kunt et al. (2016) show low levels of saving for old age globally, using the Global Findex data, with some 40-45% of adults in the UK saving for old age. Despite having a sophisticated financial environment, the UK continues to face significant concerns about the adequacy of retirement savings and the long-term sustainability of pension outcomes, highlighting the need for policies that enhance financial capability and protect individuals from the risks inherent in market-based retirement provision. This underscores the need for DC plans to foster financial literacy and engagement, empowering individuals to manage their retirement portfolios actively.

In the United Kingdom, the 2012 introduction of the auto-enrolment pension scheme marked a significant shift from traditional defined-benefit (hereafter DB) plans to DC plans. The UK's auto-enrolment policy was explicitly designed to address

pension sustainability by encouraging active employee participation and prudent financial decision-making (Foster, 2018). The scheme automatically enrols employees aged 22 and above, earning more than £10,000 annually, into workplace DC pensions with employer contributions. Participants retain flexibility to adjust their contribution rates, opt out, or rejoin at a later stage. Additionally, they can select investment products for their pension pots and set their preferred risk levels, granting greater control and choice over retirement investments (Curry, 2008; Ring, 2012).

Our study leverages data from the 2018 Financial Capability Survey of UK Adults, encompassing 4,082 individuals across the UK, to examine the effects of auto-enrolment on retirement financing behaviours. The Financial Capability Survey provides one of the most comprehensive datasets available to analyse the effects of auto-enrolment on retirement behaviours. Using this dataset, we address key questions: (a) What are the benefits of auto-enrolment for retirement finances? (b) Does participating in a DC plan encourage greater engagement in retirement planning? (c) Do individuals rely solely on their pensions, or do they pursue alternative investments? (d) What broader effects does DC participation have on retirement financial behaviours? By addressing these questions, this study provides new insights into the benefits and implications of DC pension plan participation under the auto-enrolment scheme.

Analysing the relationship between auto-enrolment and retirement financing behaviours presents several empirical challenges. Not all individuals contribute to a pension plan, with some preferring alternative savings methods outside the pension system. This creates potential selection bias, which must be addressed to avoid misinterpretation of results. To account for this, we employ a two-stage Heckman correction model. Additionally, participation in a DC plan may involve endogeneity due to omitted variables. To address this, we employ an endogenous-treatment-effects model, using two exogenous instruments: whether an individual is a post-auto-enrolment pension planner and their level of retirement literacy. Our empirical strategy adopts a sequential decision-making framework. First, we identify the determinants of individuals' decisions to contribute to a pension plan. Second, we examine the factors influencing the choice of a DC plan. Third, we analyse whether DC participation affects retirement strategy and capability via a series of personal financial outcomes.

Our analysis reveals that the pension reform has significantly influenced retirement planning in the UK. It has increased pension plan participation, particularly in DC plans, and induced strategic retirement-planning behaviour that does not rely on pensions exclusively. Both passive and active strategies seem encouraged by exposure to DC plans. Specifically, we find that individuals are more likely to report that they will also rely on partners' pension on to consider continuing to work. On the more proactive side, we also show that individuals in DC plans are also more likely to diversify their retirement savings by investing in both liquid and illiquid assets. They are more than twice as likely to save and to save for old age explicitly, to invest in stocks, and to consider downsizing or buy-to-let properties.

Our results show significant regional variations in retirement planning behaviours related to participation in DC pension plans across the UK. DC participants show higher financial engagement, notably increased household savings, stock investments, and real estate holdings, particularly in Wales, West Midlands, South West, and London. Lifecycle analysis further reveals that younger and middle-aged DC participants are less reliant solely on pensions, instead diversifying retirement strategies by engaging actively in investment markets and accumulating assets, aligning well with lifecycle theory.

Causal mediation analysis reveals that the beneficial effects of DC plan participation on retirement planning largely operate through enhanced financial literacy and the breadth of financial information sources used, highlighting the critical roles of regulatory knowledge and tax incentives. Conversely, professional financial advice alone does not significantly mediate these relationships. Thus, the findings underscore the importance of targeted financial education, transparent regulatory frameworks, and accessible tax-related information in promoting proactive retirement planning and improving overall financial resilience among DC participants.

We contribute to the literature that supports dynamic, individualized asset allocation strategies for DC pension plans (Cairns et al., 2006; Sialm et al., 2015; Konicz and Mulvey, 2015; Beshears et al., 2024). In addition, we build on recent studies finding that the automatic enrolment in DC plans could amplify behavioural biases that deteriorate retirement financing decisions (Beshears et al., 2011; Beshears et al., 2023).

The shift toward DC pension schemes under the UK's 2012 auto-enrolment policy has significant implications not only for individual financial behaviour but also for corporate financial reporting and governance. Accounting research highlights that pension plan accounting estimates and assumptions influence corporate decisions regarding pension offerings, with firms increasingly transitioning from DB to DC plans to manage financial reporting risks and reduce balance sheet volatility (Comprix and Muller, 2011; Clark, et al., 2012). This accounting-driven shift consequently places greater responsibility on employees, who become more proactive in their retirement planning, saving, and investment behaviours. Graham, et al. (2012) demonstrate how firms' disclosures about pension risks – including those associated with DC schemes – affect investor perceptions and firm valuation, and show such engagement is beneficial.

Moreover, robust audit practices that ensure transparency in pension disclosures enhance investor confidence, thereby reinforcing prudent investment and savings decisions among employees (Chuk, 2013; Christensen, et al., 2013). Thus, the accounting and auditing frameworks surrounding DC pensions play a crucial role in fostering increased individual financial responsibility, directly aligning with the policy's objective to encourage active saving and diversified investment for retirement. If complemented with financial education initiatives – encouraging planning for the long term – and information disclosure via easily accessible online resources founded upon optimal choice architecture for DC plan participants, these frameworks could significantly amplify the positive impacts of auto-enrolment. Enhanced financial literacy and clear, accessible pension-related information would empower individuals to navigate investment risks, align their savings strategies with their retirement objectives, and ultimately secure greater financial well-being in retirement.

This study is organized as follows: Section 2 reviews the related literature, arriving to our hypothesis. Section 3 describes the data and empirical strategy. Section 4 presents the empirical results. Section 5 presents the causal mediation analysis and related policy implications. Finally, section 6 concludes.

2. Background and literature

Recent literature highlights the critical importance of retirement planning in achieving financial security, particularly amidst growing global concerns about the sustainability of pension systems (Merton, 2014). Discussions have increasingly centred on the effectiveness of various strategies in fostering pre-retirement engagement and securing long-term financial stability (Ekerdt, et al., 1996). While DB pension systems remain prevalent in both developed and developing countries, their long-term viability continues to be a topic of debate. In response, many governments are introducing policies to encourage employees to take a more active role in managing their pension funds (McGowan and Lunn, 2020). The shift towards DC pension plans aims to address sustainability concerns by transferring greater responsibility to employees. This transition also offers individuals more choices, significantly shaping their financial behaviours and savings patterns (Choi, 2015).

2.1 Pension auto-enrolment in the United Kingdom

The United Kingdom's pension system has undergone significant reforms over the past decade. The Pensions Act of 2008, influenced by the Curry Commission (Curry, 2008), introduced a major reform to the UK pension system. Gradually implemented from 2012 onwards, this reform requires employers to automatically enrol employees into workplace pension schemes while allowing individuals the flexibility to opt out and/or re-enrol later. The policy aims to enhance the sustainability of pension funds and provide a secure retirement income for the British workforce. These changes were driven by an aging population and the urgent need to strengthen the viability of non-state pension schemes. As a result of auto-enrolment, participation increased substantially, from 31% of employees in 2012 to 73% in 2016, as more employers complied with the legislation (Foster et al., 2021). Moreover, the auto-enrolment scheme has been effective in fostering better pension-saving habits, resulting in higher average contribution rates due to the inclusion of newly enrolled employees (Cribb and Emmerson, 2016)[1].

[1] Despite its success, the policy has faced criticism for excluding certain social groups, particularly carers, a demographic in which women are disproportionately represented (Foster et al., 2021; Ginn and MacIntyre, 2013).

The shift toward DC pension schemes presents opportunities and challenges. On the one hand, DC plans offer the potential to improve pension savings by giving employees greater control over their retirement funds. On the other hand, they expose participants to investment risks, requiring them to make informed decisions about how their pension funds are managed. Building trust in the system is crucial, as both employers and employees need to make sound financial choices to mitigate these risks (Ring, 2012). Younger cohorts are particularly prone to delaying retirement savings due to limited financial knowledge, lack of advice, and short-term thinking, as the focused interview groups by Foster (2017) have shown. In a subsequent study, Foster (2018) emphasized the concept of "active aging" as a strategy to promote life-course retirement planning and active societal participation, addressing future pension challenges.

In summary, the introduction of auto-enrolment pension schemes in the UK represents a transformative policy shift toward DC pensions. The primary goal has been to engage a larger segment of the workforce in active financial decision-making, thereby ensuring more reliable retirement incomes. While the system has faced valid criticism regarding its exclusions, it offers significant advantages to employees. However, the inherent risks of DC pensions highlight the need for trust, effective decision-making, and robust risk management.

2.2 DC plans and planning for the long term

As the United Kingdom transitions from DB to DC pension schemes, concerns have arisen about the potential risks and long-term implications of DC plans on individuals' wealth dynamics. Financial literacy plays a pivotal role in retirement planning and securing future income (Lusardi and Mitchell, 2011; Fornero and Monticone, 2011; Panos and Klapper, 2011). However, significant challenges persist, such as exposure to stock market risks and their impact on pension funds. Benartzi and Thaler (2013) highlight that an aging population exacerbates concerns about the sustainability of pension systems, even in advanced economies like the United States and the United Kingdom. Employees' inertia in organizing their retirement plans further compounds these issues. For example, in 2010, nearly half of the U.S. workforce – approximately 78 million individuals – did not participate in any pension plan, underscoring the need for greater engagement.

DC plans aim to bridge this gap by encouraging employees to take an active role in retirement planning and develop consistent saving behaviours (Card and Ransom, 2011). Contributions from both employers and employees, along with the flexibility to exceed minimum contribution rates, help mitigate some risks associated with these plans. Studies such as Borsch-Supan, et al. (2015) show that DC schemes in Germany positively influenced retirement planning, particularly among households with higher financial literacy. However, the benefits were less pronounced among individuals with lower education levels, who exhibited minimal changes in their saving behaviours.

Risk management remains a critical challenge for DC plans. Greater exposure to investment decisions and financial products increases volatility and can lead to less stable returns. For instance, Sialm, et al. (2015) found that DC plans in the United States exhibited higher volatility compared to traditional DB schemes. The authors have identified inertia in modifying pension portfolios, recognizing though the positive effects of employer contributions in motivating their employees to be proactive. Participants in modern plans have been previously shown to be proactive and willing to take control of their retirement finances, despite showing signs of myopic financial behaviours (Carroll et al., 2009; Choi et al., 2011). Thus, Mitchell and Utkus (2022) emphasize the role of fund managers in moderating these risks, reducing volatility, and mitigating losses. The U.S. corporate retirement plan market has seen substantial growth, expanding from $5 billion in 2000 to $734 billion in 2018. Sophisticated investment strategies within this market have driven higher equity values and returns, with projections suggesting that such strategies could increase retirement plan values by up to 50% over a 30-year period.

In conclusion, the UK's adoption of auto-enrolment pension schemes represents a significant policy shift toward creating a more sustainable and secure pension system. By encouraging employees to actively engage in retirement planning, the system seeks to ensure stable retirement incomes. While DC pension plans face criticisms and inherent risks, their potential benefits – including increased savings, greater financial autonomy, and flexibility – can outweigh the challenges. As the population continues to age, DC schemes will play an increasingly critical role in addressing the pressing issue of pension sustainability.

2.3 What mediates the DC-plan effect on personal financial management?

Several variables could mediate the relationship between DC plan participation and personal financial management among individuals in the UK. Our review of the relevant literature (Byrne, 2007; Clark, et al., 2012; Lusardi and Mitchell, 2014; inter alia) identifies the following grouping of candidate mediators: (1) bequest motives, e.g., having children; (2) behavioural factors, e.g., risk tolerance and/or time horizon; (3) income level and stability; (4) trust in the financial system, e.g., using professional advice and guidance; (5) tax incentives and regulatory knowledge, e.g., using a breadth of suitable information sources; (6) financial confidence and self-efficacy, e.g., financial literacy.

Bequest motives – i.e., the desire to transfer wealth to heirs or others upon death – significantly influence personal financial management by shifting the focus from personal lifetime consumption to wealth accumulation and preservation for beneficiaries. Individuals with strong bequest intentions often save more, invest strategically, spend conservatively during retirement, and engage in sophisticated estate planning to ensure wealth transfers efficiently and tax-effectively. Their financial decisions may include acquiring life insurance, adopting either more aggressive or conservative investment strategies, and reducing personal consumption to prioritize the financial security of heirs[2].

Income levels and income stability significantly influence personal financial management by shaping individuals' capacity and willingness to save, invest, and engage in long-term financial planning. Higher income typically increases individuals' ability to allocate resources towards savings and investments, enabling greater diversification of financial assets and improved financial resilience. Conversely, lower income often restricts individuals' capacity for regular savings and investment, limiting opportunities for wealth accumulation. Similarly, greater income stability allows individuals to plan confidently for the long term, facilitating consistent

[2] There is a rich literature highlighting the importance of bequest motives in financial decision-making. Modigliani (1988) discusses how bequest motives influence saving behaviour within the lifecycle framework, noting the impact on capital accumulation and intergenerational transfers. Kotlikoff and Summers (1981) argue that intergenerational transfers, motivated by bequests, account for a substantial portion of aggregate wealth accumulation. Additionally, Bernheim, et al. (1985) demonstrate that bequest motives shape individual financial behaviours, including savings, investment, and consumption patterns, underscoring their critical role in understanding personal financial management.

financial practices, while income volatility often leads to cautious or short-term-oriented financial behaviours aimed at managing uncertainty[3].

Behavioural factors such as risk tolerance and time horizon significantly influence personal financial management by shaping individuals' decisions regarding savings, investments, retirement planning, and asset allocation[4]. Investors with higher risk tolerance typically prefer riskier, growth-oriented assets, potentially leading to higher returns but greater volatility. Conversely, those with lower risk tolerance often prioritise safer, more conservative investments, aiming primarily to preserve capital. Likewise, an individual's time horizon—the expected period until invested funds are required—influences willingness to accept investment risks, Longer horizons typically allow for higher equity exposure, while shorter horizons encourage more conservative and liquid asset choices.

Trust in the financial system significantly influences personal financial management by shaping individuals' willingness to engage with financial institutions, seek professional advice, and invest in various financial products. Individuals with higher trust levels are more likely to consult financial professionals, use financial advisory services, and participate actively in long-term investment strategies, such as pensions or diversified investment portfolios. Conversely, low trust in financial institutions can discourage individuals from seeking professional advice or guidance, potentially resulting in overly conservative financial behaviours, limited financial market participation, and suboptimal savings and investment outcomes[5].

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[3] The relevant literature highlights these effects clearly. Carroll and Samwick (1997) show that higher and more stable income positively affects household saving and wealth accumulation, as stable income streams reduce precautionary saving behaviours and allow more strategic financial planning. Lusardi (1998) demonstrates that income uncertainty significantly increases precautionary savings, underscoring the importance of income stability in shaping financial behaviours. Furthermore, Dynan, Skinner, and Zeldes (2004) find that households with higher incomes not only save at higher rates but also have more flexibility in adopting effective financial management strategies.

[4] Relevant literature emphasises the significance of these behavioural factors. Grable and Lytton (1999) identify risk tolerance as a critical determinant of investment decisions and portfolio allocation, while Barberis and Thaler (2003) illustrate how behavioural biases and individual preferences can systematically affect financial choices. Additionally, Chen (2013) shows how behavioural traits influenced by linguistic structures – such as time preferences or patience – can shape economic decisions and financial management practices, particularly in relation to long-term planning, savings, and investments.

[5] The literature highlights the critical role of trust in shaping financial behaviours. Guiso, Sapienza, and Zingales (2008) demonstrate that higher trust in financial institutions is associated with increased stock market participation and broader use of financial advice and products. Similarly, Georgarakos and Pasini (2011) find that trust in financial advisors significantly affects individuals'

Indeed, professional advice has emerged as a vital tool for effective policy implementation, helping individuals optimize retirement planning and achieve long-term financial goals (Marsden et al., 2011; Anderson et al., 2017; Ryan, 2021). Seeking professional or financial advice improves fund management and overall financial behaviours (Chatterjee and Fan, 2023). Professional financial advice can influence personal financial management by enhancing financial literacy, shaping investment and saving behaviours, and improving overall financial outcomes[6]. Individuals who consult professional advisors tend to achieve better portfolio diversification, adopt disciplined savings plans, optimize tax efficiency, and better align their financial strategies with long-term goals, including retirement and estate planning. Professional advisors also mitigate common behavioural biases such as emotional investing, herding, and short-termism, ultimately promoting financial well-being and greater wealth accumulation over time.

Tax incentives and regulatory knowledge significantly influence personal financial management by shaping how effectively individuals utilise available financial opportunities, such as pensions, savings accounts, and investment products. Individuals who understand tax incentives and regulatory frameworks – often due to exposure to a broad and diverse range (breadth) of information sources – tend to engage in more tax-efficient financial behaviours, optimising their savings, investments, and long-term financial planning. Conversely, individuals lacking such knowledge or with limited information sources may miss opportunities to benefit from tax advantages or make suboptimal financial decisions, negatively impacting wealth accumulation and retirement preparedness[7].

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decisions to seek professional financial guidance, leading to improved asset allocation and financial outcomes. Furthermore, Agnew et al. (2012) show that trust influences retirement planning behaviours, suggesting that individuals who trust financial institutions and advisors are more likely to engage effectively in retirement preparation and wealth accumulation.

[6] Related literature emphasizes the measurable impact of professional advice on financial outcomes. Collins (2012) highlights that financial advice significantly improves clients' financial decision-making, especially regarding retirement savings and investment diversification. Marsden, Zick, and Mayer (2011) demonstrate that households utilizing financial advice have notably higher net worth and are more effective at wealth accumulation compared to non-advised households. Additionally, Kramer (2012) argues that professional financial advice plays a crucial role in mitigating cognitive biases and encouraging rational investment behaviours.

[7] A review of the available literature highlights the importance of tax and regulatory awareness for personal financial management. Chetty et al. (2014) show that individuals' responsiveness to tax incentives significantly affects their savings and retirement contributions. Beshears et al. (2015) demonstrate that improved regulatory transparency and greater exposure to financial information significantly increase individuals' participation in tax-advantaged saving plans. Similarly, Lusardi

Indeed, the availability and exposure to public and private financial information significantly impact personal financial management by influencing investment decisions, asset allocation, and overall financial behaviour. Investors with access to high-quality public information, such as transparent market data, government reports, and reliable financial news, tend to make better-informed decisions, leading to improved investment returns and effective risk management. In contrast, the availability of private or exclusive information – often accessible through professional networks, advisors, or institutional services – can provide further advantages, including superior timing and investment opportunities, though it may also create information asymmetries. Consequently, disparities in information access can lead to differences in financial outcomes, emphasizing the importance of both information quality and accessibility for optimal financial decision-making[8].

Financial confidence and self-efficacy significantly influence personal financial management by enhancing individuals' ability to engage proactively in effective financial planning, investment decisions, and debt management. Individuals with high financial confidence, typically stemming from greater financial literacy[9], feel more capable of navigating complex financial products, setting realistic financial goals, and responding appropriately to economic uncertainty. Conversely, low financial

and Mitchell (2014) underline that financial literacy – including regulatory and tax knowledge derived from diverse sources – is crucial for informed financial decision-making, positively influencing wealth accumulation, retirement planning, and financial wellbeing.

[8] Related literature underscores the role of public and private information availability in shaping financial decisions and outcomes. Easley and O'Hara (2004) demonstrate that differences in public and private information availability significantly affect asset prices, risk management practices, and investment portfolio decisions. Grossman and Stiglitz (1980) argue that financial market efficiency depends heavily on information distribution, highlighting that investors with privileged access to private information often achieve superior financial outcomes. Peress (2004) further examines the impact of information availability, suggesting that greater exposure to financial information improves individual investment decisions and contributes to increased financial market participation. Information exposure enhances policy knowledge and decision-making (Duflo and Saez, 2003), often through workplace communication (Collins and Urban, 2016) or personalized information delivered via technology (Hoffmann and Plotkina, 2020).

[9] Early UK-based studies emphasised the role of cognitive skills and numeracy in retirement planning (Banks et al., 2010; Smith et al., 2010), while more recent research, drawing on Lusardi's (2008) framework, explores the broader implications of financial literacy on long-term household financial health. Improved financial literacy has been linked to better debt management, stronger household finances, and enhanced portfolio performance (Gathergood and Disney, 2011; Gathergood, 2012). Conversely, low financial literacy increases households' exposure to financial risks, such as difficulty managing income shocks and misunderstanding of credit terms (Gathergood, 2012; Disney and Gathergood, 2013). Additionally, financial confidence and literacy intersect with cultural, demographic, and gender factors; financially literate individuals in the UK are less susceptible to political polarisation and are less redistributive in their attitudes (Montagnoli et al., 2016; 2017).

confidence and self-efficacy, often linked to poor financial literacy, lead to cautious or suboptimal financial behaviours, increased vulnerability to financial risks, and limited ability to cope with income shocks.

2.4 Hypothesis

Based on these considerations our study tests a simple hypothesis – and its several variants – that has not received much attention in the literature, namely:

$$H_1: \textit{Exposure to the DC pension plan increased retirement planning and capability}$$

The counterfactual hypothesis H_0 would suggest that exposure to a DC plan did not have any effects on planning for the long term or even entailed negative effects in terms of saving and investing behaviour, and diversification. In essence, we are interested in examining if DC plan participants are more likely to diversify their retirement financing sources, such as relying on partner pensions, continuing employment after retirement, and investing in financial and real estate assets.

3. Data and empirical strategy

We utilize the 2018 Financial Capability Survey, a cross-sectional dataset providing a comprehensive overview of financial capability among adults in the UK. This dataset builds upon the previous 2015 survey by incorporating additional measures of financial capability. The sample includes 5,974 individuals, spanning both working-age and retired populations. Out of the total sample were of working age, while 1,306 were aged 65 or older, 50 were younger than 18, an additional 283 were retired, and 256 were inactive. Hence, our sample comprises of 4,082 working-age individuals, aged 18-64. The survey covers all UK regions, facilitating regional analyses across England, Scotland, Wales, and Northern Ireland[10].

[10] In 2021, the Money and Pensions Service (MaPS, formerly Money Advice Service) conducted the Adult Financial Wellbeing Survey, which is a continuation of the earlier Financial Capability Surveys conducted in 2015 and 2018. This survey is nationally representative, encompassing over 10,000 UK adults aged 18 and above. However, for the purposes of our study, the 2018 Financial Capability Survey has unique advantages in terms of question coverage. Moreover, the newer survey of 2021 has a broader scope and an additional emphasis on Covid-19.

Panel A of Table 1 summarizes key demographic and retirement planning variables for the pooled sample and subgroups: DC plan participants, DB plan participants, individuals with both types of plans, and those without any pension plans. Weighting adjustments were applied to ensure representativeness across age, gender, and geographic region. Weighted t-tests were used to compare averages between DC and DB plan participants.

The average participant age was 39.7 years, with males comprising 50.2% of the sample. Approximately 40.5% held a university or vocational degree, while 7.3% lacked formal qualifications. Most participants were of white ethnicity (90.6%) and were either single (41%) or married (49.8%). On average, participants had one child (0.71) and primarily lived in large cities (54.9%) or smaller cities (32.2%). A significant proportion (41.9%) were homeowners with outstanding mortgages, and the mean gross household income was £28,370. Most participants were employed (71%), followed by self-employed individuals (7.9%), with 4.9% unemployed. England was the most common country of residence (83.5%), followed by Scotland (8.7%), Wales (4.9%), and Northern Ireland (2.9%).

[INSERT TABLE 1 ABOUT HERE]

3.1 Descriptive statistics

The summary statistics in Table 1 reveal significant demographic differences between individuals participating in DC and DB pension plans. DC participants are, on average, significantly younger than those in DB plans, with an age gap of approximately 1.8 years ($p < 0.01$). This aligns with the expectation that DC plans, which have gained prominence following the 2012 UK auto-enrolment policy, are more likely to include younger employees entering the workforce. Furthermore, DC plan participants are significantly more likely to be single (40.8%) compared to DB plan participants (29.7%), suggesting differences in family structures that could influence long-term financial planning behaviour.

In terms of education, DC participants show a higher proportion of university degree holders (25.3%) compared to DB participants (19.5%), with the difference being statistically significant ($p < 0.05$). However, DB participants exhibit higher representation among postgraduate degree holders (22.2% vs. 19.1%), though this difference does not reach statistical significance. Additionally, DC participants are less

likely to have no formal qualifications (3.6%) compared to DB participants (5.2%), indicating that higher educational attainment is associated with pension participation in general.

Another notable distinction is in homeownership status. While DB plan participants are more likely to own their homes outright (25.5% vs. 14.4%), DC participants are significantly more likely to have an outstanding mortgage (53.0% vs. 45.7%), reflecting differences in wealth accumulation and financial responsibilities across pension plan types. This distinction could also be linked to the age differences observed between the two groups, as younger individuals are more likely to hold mortgages while older individuals have either fully repaid their loans or acquired housing wealth over time.

From a regional perspective, significant variations exist in England, Wales, and Northern Ireland. DC plan participants are slightly more concentrated in England (83.6%) compared to DB participants (79.9%), while DB plan participants are more likely to reside in Wales (6.1%) and Northern Ireland (3.5%), with these differences statistically significant at the $p < 0.01$ level. These regional variations may reflect differences in employer pension offerings, labour market structures, and financial behaviours across the UK.

In terms of household income, DC participants report higher gross household earnings, averaging £34,853, which is £3,526 higher than DB participants (£31,326), with statistical significance at the $p < 0.05$ level. This suggests that income levels may play a role in pension plan choice, with higher-income individuals being more likely to opt for DC schemes, potentially due to greater flexibility and investment options. Taken together, these findings highlight clear demographic, financial, and regional differences between DC and DB pension participants, shedding light on the distinct financial circumstances and planning behaviours associated with different pension schemes.

To examine retirement planning behaviours, we first identified seven key variables related to retirement strategy, namely: (1) A dummy variable for reliance solely on a workplace, personal or state pension for retirement; (2) A continuous variable for the number of retirement-financing sources, ranging between 0 and 7; (3) A dummy variable for reliance on a partner's pension for retirement, apart from own

pension; (4) A dummy variable for planning to continuing to work after retirement, apart from receiving own pension; (5) A dummy variable for ownership of financial assets, other than own pension, namely savings, investments or real estate; (6) A dummy variable for ownership of liquid assets, other than own pension, namely savings or investments; (7) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release or buy-to-let or other income from a property which is not the primary residence.

Then we identified an additional six personal-finance variables that are relevant to retirement capability. These are: are the following: (1) A continuous variable for the logarithm of the amount in household savings; (2) A continuous variable for the savings to income ratio of the household; (3) A dummy variable for saving for old age; (4) A dummy variable for ownership of stocks; (5) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release; (6) A dummy variable for ownership of illiquid assets, other than own pension, namely buy-to-let or other income from a property which is not the primary residence.

Panel B of Table 1 highlights significant differences in retirement financial strategies between groups. Notably, DC plan participants are less reliant solely on pensions for retirement (25.1%) compared to DB plan participants (31.7%), with this difference being statistically significant. This suggests that DC plan holders are more likely to diversify their retirement income sources beyond traditional pension income. Additionally, DC plan participants report having a higher number of retirement financing sources (2.79 on average) compared to DB participants (2.58), which aligns with previous findings on the importance of financial diversification.

When examining specific sources of retirement income, DC plan holders are significantly more likely to invest in financial assets for retirement. The proportion of DC plan participants engaging in pension-related investments is 49.8%, compared to 39.7% of DB participants ($p < 0.01$). This effect is particularly pronounced in liquid assets such as savings and investments (44.6% vs. 34.8%, $p < 0.01$). In addition, illiquid assets (real estate investments for retirement purposes) are also more common among DC participants (20.1% vs. 15.1%), albeit with slightly lower significance.

In terms of savings behaviour, DC participants report lower household savings on average (£12,160.6) than DB participants (£12,916.1), although this difference is

not statistically significant. Their savings-to-income ratio (0.206) is significantly lower than that of DB participants (0.229), with the difference being statistically significant at the 1% level. Moreover, DC participants are significantly more likely to save specifically for old age (36.7% vs. 32.5%), demonstrating a greater emphasis on long-term financial planning. Lastly, DC plan holders are more likely to engage in stock investments (18.2% vs. 13.4%) and consider real estate as part of their retirement plan (7.9% vs. 4.0%), with these differences being statistically significant.

Panel C of Table 1 provides insights into instrumental variables and potential mediators affecting pension plan participation and financial outcomes. The entry into employment post-auto-enrolment reform appears to play a crucial role in pension plan selection, with 28.1% of DC plan holders entering the workforce after auto-enrolment, compared to 22.8% of DB plan participants, a statistically significant difference ($p < 0.1$). This aligns with the expectation that DC plans are more prominent among new workforce entrants due to policy design. Another important factor is retirement literacy, where DC participants score significantly higher (0.877) than DB participants (0.615) ($p < 0.01$).

Interestingly, bequest motives (e.g., having children) do not show significant differences between the two groups (43.1% for DC, 43.2% for DB). However, the role of present bias, with DC plan holders reporting insignificantly higher scores (3.34 vs. 3.189). Exposure to professional financial and retirement advice does not differ significantly between the two groups, although it is slightly higher for DB plan holders (24.1% vs. 26.7%). Neither does the exposure to financial information sources, although it is slightly higher for DC plan holders (2.184 vs. 2.073). Finally, financial literacy scores differ between the two groups. The financial literacy scores of DC plan holders are significantly higher (2.184 vs. 2.073, $p < 0.05$).

3.2 Estimation strategy: Endogenous-treatment effect models with selection correction

To estimate the effect of DC exposure on planning for the long term, we employ a three-stage endogenous-treatment effects model, that accounts for the endogeneity of joining a DC plan and the selection into having any pension plan in the Financial Capability Survey data. To correct for sample selection bias, we employ the Heckman two-step approach (Heckman, 1979; Vella, 1998). Given that DC plan participation is endogenous, we adopt a control function approach (Rivers and Vuong, 1988;

Wooldridge, 2015) in the second stage. Finally, to estimate financial outcomes while correcting for selection and endogeneity, we follow the structural treatment effects framework (Heckman and Vytlacil, 2005; Imbens and Angrist, 1994)[11]. In sequence, the three decisions are the following:

1) Whether individuals choose to contribute to any pension plan at all. This is essentially a sample selection issue for the outcomes of interest in the next stage. Hence, we utilize a probit model to estimate the decision by individuals to opt to contribute to a pension plan. This first-stage equation helps account for selection bias and representation of the broader population in follow-up stages.

2) Whether individuals selecting a DC pension plan, conditional on their prior decision to contribute to any pension plan. We employ a second-stage Heckman probit model via incorporating the inverse Mills ratio calculated from the previous stage in order to account for selection. Obviously, the decision to join a DC plan involves endogenous choice, and hence its econometric treatment will become joint with the follow-up third decision, conditional on selection at the first stage.

3) Whether individuals rely on their pension only for retirement (workplace, private or state pension), after joining a DC pension plan, and conditional on contribution to a pension plan. Related decisions involve an additional 6 outcomes, namely a continuous variable for the number of retirement-financing sources, ranging between 0 and 7; a dummy variable for reliance on a partner's pension for retirement, apart from own pension; a dummy variable for planning to continuing to work after retirement, apart from receiving own pension; a dummy variable for ownership of financial assets, other than own pension, namely savings, investments or real estate; a dummy variable for ownership of liquid assets, other than own pension, namely savings or investments; and a dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release or buy-to-let or other income from a property which is not the primary residence.

The conceptual framework addresses the policy's influence on workers' retirement finances while mitigating estimation biases. At the first stage, we correct for selection bias using the Heckman model. Additionally, we address endogeneity issues, such as omitted variables and reverse causality, to ensure robust and reliable

[11] We augment Stata's etregress command, to correct for selection via the inclusion of the inverse Mills ratio calculated from a first-stage probit regression.

estimates. To demonstrate the effect of auto-enrolment (x_1) on retirement planning (y_1), the Heckman model can be expressed as follows:

$$y_1^* = x_1' \times \beta_1 + x_3 \times \beta_3 + u_1 \quad (1)$$

$$y_2^* = x_2' \times \beta_2 + x_3 \times \beta_3 + u_2 \quad (2)$$

$$y_1 = y_1^* \quad if\ y_2^* > 0 \quad (3)$$

$$y_1 = 0 \quad if\ y_2^* \leq 0 \quad (4)$$

Equation (2) describes a probit model for the propensity to own a pension plan (y_2). The variables y_1^* y1* and y_2^* are unobserved. The vector of control variables x_3 appears in both models. The exclusion restriction in the baseline Heckman Probit equation (2) assumes that employed or self-employed individuals are expected to know whether they own a pension plan. The two-stage correction enables us to present population-representative findings. The error terms in the first and second stages are represented by u_1 and u_2, respectively.

Heckman (1979) suggested estimating the two-stage limited-information maximum likelihood model using the conditional expectation of y_1^* for the pension-owning subsample:

$$E(y_1^*|x_1, y_2^* > 0) = x_1' \times \beta_1 + E(u_1|u_2 > -x_2' \times \beta_2) \quad (5)$$

Under the assumption of a bivariate normal distribution for the error terms, the conditional expectation of u_1 is:

$$E(u_1|u_2 > -x_2' \times \beta_2) = \frac{\sigma_{12}}{\sigma_2} \times \frac{\varphi\left(-\left(x_2' \times \frac{\beta_2}{\sigma_2}\right)\right)}{1-\Phi\left(-\left(x_2' \times \frac{\beta_2}{\sigma_2}\right)\right)} \quad (6)$$

where $\varphi(.)$ *φ(.)* and $\Phi(.)$ represent the normal and cumulative normal densities of the standard normal distribution, respectively. That means that the conditional expectation of y_1^* can be transformed to:

$$E(y_1^*|x_1, y_2^* > 0) = x_1 \times \beta_1 + \frac{\sigma_{12}}{\sigma_2} \times \frac{\varphi\left(-\left(x_2' \times \frac{\beta_2}{\sigma_2}\right)\right)}{1-\Phi\left(-\left(x_2' \times \frac{\beta_2}{\sigma_2}\right)\right)} \quad (7)$$

Heckman (1979) proposed using the inverse Mills ratio from the first stage and the probit estimation:

$$\lambda\left(x_2' \times \frac{\beta_2}{\sigma_2}\right) = \frac{\varphi\left(-\left(x_2' \times \frac{\beta_2}{\sigma_2}\right)\right)}{1-\Phi\left(-\left(x_2' \times \frac{\beta_2}{\sigma_2}\right)\right)} \quad (8)$$

This corrects any selection bias in the second step. According to Heckman (1979), selection bias is a special case of omitted variable bias.

Furthermore, for the analysis in the third stage of the correction model and upon treating for selection bias, we observe that λ might still suffer from omitted variable biases and reverse causality in the outcome model in the second stage, starting from equation (9). To obtain unbiased and consistent estimates, we follow Wooldridge (2010) by estimating linear endogenous-treatment regressions, assuming that u_2 follows a normal distribution and that the error term is homoscedastic. These can be expressed through the following set of equations:

$$y_{0i} = x_i \times \beta_0 + \varepsilon_{0i} \quad (9)$$

$$y_{1i} = x_i \times \beta_{1i} + \varepsilon_{1i} \quad (10)$$

$$t = \begin{cases} 1, if\ w_i \times \gamma + u_i > 0 \\ 0, otherwise \end{cases} \quad (11)$$

Here y_{oi} and y_{1i} represent the non-treatment and treatment outcomes for household finance outcomes, respectively, while t represents treatment under DC participation. The covariates x_i and w_i are assumed to be uncorrelated with the error terms and exogenous. We observe either outcome and, depending on the treatment, the observed outcome is given by:

$$y_i = t_i \times y_{1i} + (1 - t_i) \times y_{0i} \quad (12)$$

The linear endogenous treatment regressions, which form the primary econometric model in the analysis, employ the instrumental variables (IV) method to address residual estimation bias. Two instrumental variables were selected based on their ability to satisfy the relevance and exogeneity criteria essential for IV analysis.

The first instrumental variable is policy-related: a dummy variable indicating whether the individual began contributing to a pension plan after the introduction of the auto-enrolment legislation. Specifically, it captures those who started contributing post-2012 and meet the criteria stipulated by the policy, including being older than 22 years and earning an annual income exceeding £10,000. This variable is constructed

from survey responses on the number of years participants have contributed to their pension plans[12].

The second instrumental variable pertains to retirement literacy, ranging between 0 and 2. It is based on two survey questions assessing whether participants understand the distinctions between DC and DB pension plans[13]. Both instrumental variables are strong predictors of the endogenous variable (choosing a DC plan) and are exogenous to the dependent variables of the third stage of the model, i.e., regarding retirement financial behaviours[14].

3.3 Causal mediation analysis

A fourth final stage of the empirical analysis employs causal mediation analysis, following the framework proposed by Dippel et al. (2022), to deepen our understanding of confounding variables affecting the policy's impact on retirement finances. The mediation model includes three key elements: a treatment variable T (DC plan participation), a set of final outcomes Y (e.g., retirement finances and asset holdings), and mediating variables M (e.g., bequest motives, income level and stability, present bias, professional advice, information exposure, and financial literacy). The mediating variables M represent the mechanisms through which T affects Y.

The mediation model decomposes the "total effect" of T on Y into two components: the "direct effect" of T on Y and the "indirect effect" mediated through M. To ensure robust identification of these effects, we employ an instrumental variable Z to address the potential endogeneity of both T and M.

To establish the causal relationships within the partially confounded instrumental variables causal mediation model, we isolate the direct effect ($DE = \beta_{TY}$)

[12] It is important to note that the auto-enrolment policy did not result in an immediate transition of all workplace pensions to defined-contribution plans. Instead, the shift occurred gradually over time, culminating in 2018.

[13] The exact wording of the two questions is described in the Appendix Table 1. The table provides the detailed definitions of all dependent variables, instrumental variables, and candidate mediators.

[14] We acknowledge the possibility that participants' decisions – such as diversifying their pension holdings or preferences for specific pension products – may be indirectly influenced by the timing of their contributions (exposure to the new law) or their level of retirement literacy. These factors could be potential sources of confounding. However, as shown in the Appendix Table 7, apart from being intuitively appealing, our two instrumental variables also pass the validity tests of an IV model.

of T on Y, independent on M. We then estimate the indirect effect by multiplying the coefficients of M and Y by those of Y ($IE = u_M^T \times \beta_{MY}$). The total effect consists of the sum of the two terms ($TE = \eta_{TY} + \eta_{TM} \times \beta_{MY}$). The model specifications are of the form:

$$Z = \varepsilon_Z \tag{13}$$

$$T = \beta_T^Z \times Z + \varepsilon_T \tag{14}$$

$$M = u_M^T \times T + \varepsilon_M \tag{15}$$

$$Y = \eta_Y^T \times T + \eta_Y^M \times M + \varepsilon_Y \tag{16}$$

Figure 1 provides a visual representation of the partially confounded instrumental variables causal mediation model, adapted from Dippel et al. (2022) to align with the specific objectives of this study. The causal mediation analysis is conducted in three estimation steps. First, we calculate the causal effect of the treatment variable (T) on the mediating variable (M) using equation (15). Next, we determine the causal effect of T on the outcome variable (Y). Finally, as specified in equation (16), we decompose the overall effects into three components: total effects, indirect effects, and direct effects.

$$M = f_M(T, \varepsilon_M) \tag{17}$$

$$Y = f_Y(T, M, \varepsilon_Y) \tag{18}$$

[INSERT FIGURE 1 ABOUT HERE]

The relationships described in equations (17) and (18) illustrate the causal mediation process, where the effect of T is transmitted through M, influencing Y both directly and indirectly. Consequently, the regression of Y on both T and M involves two potentially endogenous variables. However, the model relies on a single instrumental variable (Z) to address their endogeneity.

4. DC plans and retirement strategies

We start by estimating the determinants of having a pension plan, i.e., the first stage of the model, in section 4.1. In section 4.2 we present the estimates from the second stage of the model, which examine the determinants of joining a DC plan. In section

4.3, we present the estimates of the third stage regarding retirement strategies and personal finances related to retirement. Then, in section 4.4 we briefly discuss the robustness exercises of the appendix, and in section 4.5 we overview regional variations and lifecycle concerns in the relationship between DC plans and financial outcomes in the UK. All regressions are weighted using sampling weights provided by the data collectors to render the results representative of the UK population. All regressions include a rich list of control variables, such as age, gender, behavioural attributes (present orientation), education (6 categories), ethnicity (white), marital status (3 categories), the number of children, a 3rd order polynomial of the logarithm of household income, home ownership status (3 categories), urbanity (3 categories), and administrative regions (12 categories)[15].

4.1 Pension plan participation

In the four columns of Table 2, we present the marginal effects from probit models, representing the first stage of the Heckman model as specified in equation (5). The dependent variable is a dummy variable which takes the value 1 if the respondent has any pension plan at all, and 0 if he/she does not. Column 1 includes only the exclusion criterion of follow-up stages, i.e., a dummy variable for paid employment. Columns 2 and 3 incorporate the two instrumental variables one at a time, namely entry post auto-enrolment and retirement literacy. Then, column 4 incorporates the two instrumental variables jointly.

The results in column 1 indicate that employees are 39.3% more likely to participate in a pension plan. The economic magnitude of the effect is calculated via the division of the estimated marginal effect by the predicted probability of the model, and it is shown at the bottom of Table 2. The effect is statistically significant at the 1% level. When the instrumental variables are incorporated in the model in columns 2-4, the magnitude and significance of the exclusion restriction remains. Individuals who began contributing after the introduction of the auto-enrolment policy are 18.9 - 36.2% more likely to have a pension plan. Moreover, retirement literacy exerts an effect of around 22% to pension plan participation.

[15] The Appendix Table 2 presents the pairwise correlation matrix between the main variables in our study.

With respect to the remaining variables, older respondents, males, the future oriented, the more educated, the widowed/divorced, mortgage owners, and those living in small cities/suburbs are the groups more likely to have a pension plan. Education emerges as a strong predictor, with individuals holding higher education levels more likely to contribute[16].

[INSERT TABLE 2 ABOUT HERE]

4.2 DC plan participation

After addressing selection bias in Table 2, we now turn to Table 3 to examine the effects of auto-enrolment and retirement literacy on the likelihood of choosing a DC pension plan, while accounting for selection into having a pension plan by incorporating the inverse Mills ratio from the first stage. Columns 1-3 present marginal effects from weighted probit regressions, along with robust standard errors in brackets. Columns 1 and 2 incorporate the two instruments separately, while column 3 includes both instruments simultaneously.

The results indicate that individuals who began contributing to a pension after the implementation of auto-enrolment in 2012 are 69.1% more likely to choose a DC plan. In column 2, higher retirement literacy exerts a positive effect of a 95.4% magnitude as shown at the bottom of the table. Both effects are statistically significant at the 1% level. When both instruments are included in column 3 the effects are of similar size, magnitude and significance[17]. These second stage estimates of column 3

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[16] In the Appendix Table 3, we present the marginal effects of an alternative multinomial probit model in columns A_1-A_3. The dependent variable is categorized into three groups, namely (1) having a pension plan; (2) not having a pension plan; and (3) being uncertain about having a pension plan. We exclude the exclusion criterion, namely paid employment, from that model as it does not constitute a part of any follow-up stages and is only there as a standalone robustness exercise. The inspection of the marginal effects shows that individuals who started contributing after the auto-enrolment policy are 20.1% more likely to consistently contribute, 27.4% less likely to opt out, and 13.1% less likely to be uncertain. Furthermore, retirement-literate individuals are 23.3% more likely to participate in a pension, 19.6% less likely to opt out, and 74.4% less likely to be uncertain. All these estimates are statistically significant at the 1% level.

[17] In the Appendix Table 3, we present the marginal effects of an alternative multinomial probit model in columns B_1-B_4. The dependent variable is categorized into four groups, namely (1) having a DC plan; (2) having a DB plan; (3) having a mix of DC and DB plans, and (4) having no pension plan. We exclude the exclusion criterion, namely paid employment, from that model as it does not constitute a part of any follow-up stages and is only there as a standalone robustness exercise. The results confirm the presence of selection bias, as the marginal effects for DC plans are smaller when selection correction is not applied. Post-auto-enrolment entrants are 27% more likely to contribute to a DC plan, as shown in column B_1. Additionally, auto-enrolment significantly reduces the likelihood of not planning for retirement, with a reduction of 26.2%. Retirement-literate individuals

serve as the first part of our follow-up endogenous treatment maximum likelihood regressions that address for endogenous choice of a DC plan for the selected number of individuals who have a pension plan. With respect to the remaining variables, older individuals, males, the more educated, singles, and mortgage owners are more likely to be enrolled for a DC plan.

[INSERT TABLE 3 ABOUT HERE]

4.3 The effect of DC plans on retirement planning and capability

We now examine the impact of having a DC plan on retirement strategies and personal finances. As outlined in the previous section, we cater to the DC-plan variable as an endogenous treatment, also accounting for selection into have any pension plan. We model two sets of dependent variables, in Tables 4 and 5 respectively, which approximate retirement strategies and personal finances separately.

In Table 4, we examine seven outcomes that reflect how individuals manage their long-term retirement finances. The dependent variables in each column are the following: (1) A dummy variable for reliance solely on a workplace, personal or state pension for retirement; (2) A continuous variable for the number of retirement-financing sources, ranging between 0 and 7; (3) A dummy variable for reliance on a partner's pension for retirement, apart from own pension; (4) A dummy variable for planning to continuing to work after retirement, apart from receiving own pension; (5) A dummy variable for ownership of financial assets, other than own pension, namely savings, investments or real estate; (6) A dummy variable for ownership of liquid assets, other than own pension, namely savings or investments; (7) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release or buy-to-let or other income from a property which is not the primary residence.

In column 1, contributing to a DC plan exerts a large negative impact on the probability of relying solely on a pension for living after retirement. DC plan participants are 70.5% less likely reject the null hypothesis that exposure to DC plans

are 27.7% more likely to have a DC plan and 9.2% less likely to opt for a DB plan. Retirement literacy is positively associated with mixed plans and negatively associated with no pension plans.

exerts a negative or no effect on retirement planning. The issue of retirement capability of course remains to be examined. In column 2, we find a large positive effect of DC plan participation on the number of sources an individual expects to use for supporting retirement. DC plan participants report twice as many sources as essential for their retirement capability.

In columns 3 and 4, we find that DC plan participants are almost twice as likely to state that they plan to also rely on the pension of a partner apart from their own. There is also a large positive association between DC plan participation and the intension to continue to work upon retirement. Some 10% of individuals state the plan to continue to work and DC plan participants are more than twice as likely to state so, compared to the remaining sample. This effect is of the highest economic magnitude among the seven columns of the table.

In columns 5, 6, and 7, we find significant positive effects of DC plan participation on stating that financial assets are planned to constitute an additional source of retirement well-being, complementing pensions. This is the case for both liquid (saving and investments) and illiquid assets (downsizing, buy-to-let, etc.). DC plan participants are around 1.5 times more likely to form strategies for retirement built around financial asset ownership. The findings suggest that DC plan participation has effectively encouraged retirement planning that aims to complement pension income with other sources. In terms of retirement capability, DC plan participation seems to be related to both more active strategies, such as financial asset ownership, and less active strategies such as continuing to work or also relying on the pension of a partner.

In terms of the remaining variables, it seems that present orientation entails negative effects to retirement planning and capability. Home ownership is largely a wealth proxy, and it seems to be positively related to retirement planning and capability.

[INSERT TABLE 4 ABOUT HERE]

In Table 5, we present the effects of DC plan participation on retirement capability, in terms of a set of an additional six personal-finance proxies. The dependent variables in each column are the following: (1) A continuous variable for the logarithm of the amount in household savings; (2) A continuous variable for the

savings to income ratio of the household; (3) A dummy variable for saving for old age; (4) A dummy variable for ownership of stocks; (5) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release; (6) A dummy variable for ownership of illiquid assets, other than own pension, namely buy-to-let or other income from a property which is not the primary residence.

Column 1 of Table 5 demonstrates that DC plan participants have some £3,485 more on household savings on average[18]. They have a 1.8 times higher savings-to-income ratio. Moreover, the are more than twice as likely to save for old age and to own stocks. In addition, they are 1.2 times more likely to consider downsizing and 1.6 times more likely to consider real estate as a source of retirement well-being, in terms of buy-to-let or other income from a property that is not a main home. Older individuals, the future oriented, the more educated, and those with higher income and wealth are those more likely to be more active in terms of the means of retirement capability. Overall, our findings suggest that participants in DC plans are taking a more proactive approach to personal financial management, aiming to improve retirement well-being. These outcomes align with policy objectives aimed at enhancing the long-term sustainability of retirement finances.

[INSERT TABLE 5 ABOUT HERE]

4.4 Robustness exercises

In the Appendix Tables 4, 5, and 6, we conduct three separate robustness exercises on outcome variables of Tables 4 and 5. We show selected dependent variables due to space considerations, as our aim is to establish the robustness of our previous estimates, in terms of sign, magnitude and significance, considering various methodological considerations. In all three tables we select six of our previous dependent variables, i.e.: (1) A continuous variable for the logarithm of the amount in household savings; (2) A continuous variable for the savings to income ratio of the household; (3) A dummy variable for saving for old age; (4) A dummy variable for ownership of stocks; (5) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release; (6) A dummy variable for ownership of illiquid assets, other than own pension, namely buy-to-let or other

[18] The effect is calculated as $e^{3.551} \times 100 = 3{,}484.81$, i.e., as the effect of a dummy variable in a model in which the dependent variable is in a logarithmic form.

income from a property which is not the primary residence. The asterisks denote the usual levels of significance. In all tables, we control for the same set of characteristics as in Tables 4 and 5, including the fixed effects for the 12 administrative regions of the UK.

In the Appendix Table 4, we present estimates from weighted maximum-likelihood likelihood of the third stage of endogenous-treatment models regarding retirement-financing sources in the UK. It serves as an alternative to Table 5, ensuring robustness in the standard errors when incorporating predictions from previous stages. Hence, bootstrapped standard errors based on 1,000 replications are reported in brackets. To account for sample selection, all specifications incorporate the inverse Mills ratio calculated at the first stage of the model shown in column 4 of Table 2. The endogeneity of DC plan participation is accounted for in the second stage of the model shown in column 3 of Table 3. The significance of our previous estimate – which is the sole concern when bootstrapping the standard errors – is confirmed.

In the Appendix Table 5, we present estimates from weighted maximum-likelihood likelihood of the third stage of endogenous-treatment models regarding retirement-financing sources in the UK. Robust standard errors are shown in brackets. It serves as an alternative to the estimates of Table 5, presenting estimates for the sub-sample that excludes individuals without any pension plan. The number of observations is reduced from 4,082 to 2,554. Hence, the models do not account for selection, i.e., the omit the first stage of the estimation methodology and exclude the inverse Mills ratio from the two remaining stages.

The effect of DC plan participation on household savings doubles to £7,872.8 more on average. The sign and significance of the effect of DC on all remaining outcomes remains. It is smaller than in Table 5 for the savings-to-income ratio, saving for old age, downsizing and real estate ownership. However, it becomes higher when it comes to stock ownership. Hence, our inclusion of an additional first stage that account for selection in the endogenous-treatment-effect model did not exert any bias to our estimates.

Finally, the Appendix Table 6 presents estimates from weighted IV regressions of the third stage of the models regarding retirement-financing sources in the UK. To account for sample selection, all specifications incorporate the inverse Mills ratio

calculated at the first stage of the model shown in column 4 of Table 2. Robust standard errors are shown in brackets. The table serves as an alternative to the maximum-likelihood (ML) endogenous-treatment-effect models presented in Table 5. It also serves as a conceptual link to the IV models used for the causal mediation analysis in Table 6. The estimated effects when using an IV model instead of a ML endogenous-treatment-effects model are remarkably close in terms of sign, magnitude and significance. Hence, the inspection of the causal mediation analysis that follows in section 5 – which are restricted by design to use IV models – will not begin on any wrong basis due to the alteration of the estimation method.

4.5 Regional variations and lifecycle concerns

The empirical analysis thus far has demonstrated how DC plan participants are more active to planning for retirement using alternative strategies, both active and passive. In this sub-section we inspect regional and lifecycle differences in retirement capability. The aim is to examine retirement finance variations across regions of the United Kingdom. Moreover, we wish to examine if younger individuals are more or less likely to save, invest and engage with financial assets. The lifecycle theory (or lifecycle hypothesis), developed by Modigliani and Brumberg (1954), posits that individuals adjust their saving and investing behaviours according to their stage in life to smooth consumption over time. The key ideas are that people aim to maintain relatively stable consumption throughout life, and as a result saving rates vary systematically by age. Investment strategies typically shift from riskier, growth-oriented investments in youth and midlife to safer, income-generating investments as retirement nears or begins.

Hence, the lifecycle theory explains how savings, investing, and consumption patterns evolve predictably over an individual's lifetime. According to Aldo and Modigliani (1963) and Modigliani (1966), the expectation is that in early working life (young adulthood), people typically earn less and may borrow or save minimally to fund current needs, such as education or household formation. By middle age (prime working years), individuals generally earn higher incomes, save significantly, and invest to accumulate wealth. Hence, this stage is crucial for retirement preparation. In later life (retirement), individuals withdraw from their accumulated savings and investments to maintain their living standards when income declines or ceases.

In Figure 2 we present estimates from regression models that include an interaction term between DC plans and the 12 administrative regions of the UK. The estimation methodology used to incorporate the interaction term is identical to that of Tables 4 and 5. We select the following six personal financial outcomes of interest from the previous tables, namely: (1) relying only on a workplace, personal or state pension plan for retirement; (2) saving for old age (dummy variable); (3) the logarithm of household savings; (4) owning stocks (dummy variable); (5) downsizing (dummy variable), and; (6) investing in real estate for retirement.

The inspection of Figure 2 suggest that individuals in DC plans are less likely to rely on pension only for retirement in most administrative regions, with the negative effect being significant in Wales, and the North West. They are more likely to save for old age in all administrative regions, with the effects being significant for 6 out of 12, i.e., in Scotland, Wales, West Midlands, North West, South West, and South East. DC plan holders have higher amounts in savings in most regions, with the effects being significant in Wales and the West Midlands. They are more likely to invest in stocks in all regions, with the effects being significant in Wales and London. They are more likely to plan to downsize in all regions, with the effect being significant in the South East. They are also more likely to invest in real estate, e.g., buy-to-let, in all regions. These latter effects are significant in Wales, West Midlands, South West and London. These results suggest that DC plans effectively encourage retirement planning and capability across most administrative regions of the UK.

[INSERT FIGURE 2 ABOUT HERE]

The inspection of Figure 3 suggests that the signs of the previously estimated effects of DC plans hold across the 3 age groups in the data, i.e., the young (18-34), the middle aged (35-50), and the old (51-64). The young DC-plan participants are significantly less likely to rely for on pensions only and they also have a significantly higher amount in savings. There is a monotonically increasing effect of DC plans on saving for old age. The young and the middle-aged in DC plans are more likely to invest in stocks, in accordance with the interpretation of the lifecycle theory for personal finance. These are the groups also more likely to consider downsizing. Finaly, young and old DC plan participants are more likely to consider investing in real estate. Hence, the majority of the panels of the figure suggest that DC plans have encouraged

behaviour consistent with the lifecycle hypothesis in the management of personal finances for retirement.

[INSERT FIGURE 3 ABOUT HERE]

5. Causal mediation analysis and policy implications

The results of the previous section have identified effects for DC plan participants that are indicative of lower reliance on pensions only when planning for retirement, and some behaviours that are indicative of active personal financial management. This is present in all administrative regions with the effects being stronger in some parts of the UK. Moreover, active personal financial management seems to occur according to the lifecycle hypothesis and that can be seen as a socially desirable outcome. In this section, we examine the candidate mediating factors that may be conducive to more active personal financial management. For policy purposes, this might be useful in identifying policy means and interventions that can further encourage active personal financial management for retirement well-being.

5.1 What mediates the effect of DC plans on personal financial management?

Our review of the relevant literature identified the following grouping of candidate mediators: (1) bequest motives, e.g., having children (Kotlikoff and Spivak, 1981; Hurd, 1987;1989; De Nardi and Yang, 2014; Suari-Andreu et al., 2019); (2) behavioural factors, e.g., risk tolerance and/or time horizon (Barsky et al., 1997; Madrian, 2014); (3) income level and stability; (4) trust in the financial system, e.g., using professional advice and guidance (Calcagno and Monticone, 2015; Foerster et al., 2017; Choi, 2022); (5) tax incentives and regulatory knowledge, e.g., using a breadth of suitable information sources (Bushee and Goodman, 2007; Edmans et al., 2017; Cookson and Niessner, 2019); (6) financial confidence and self-efficacy, e.g., financial literacy (Lusardi and Mitchell, 2011a; Bucher-Koenen and Lusardi, 2011; Van Rooij et al., 2012; Ricci and Caratelli, 2017). In this section we explore the effect of these candidate mediators using proxies available in the data. Hence, we examine if DC plan participation can have an indirect impact on personal financial management via the 6 candidate mediators. Ideally, that would weaken the effect of DC plan

participation if the variable is a moderator, and it would render it insignificant if the variable is the main mediator.

We employ the partially confounded causal mediation model proposed by Dippel et al. (2022), to decompose the total effect of DC plan participation into direct and indirect effects. This approach provides insights into the extent to which these mediating variables explain the indirect effects of the policy. It is based on an IV model with two endogenous variables, i.e., DC plan participation and the mediating factor. It has been previously described and illustrated in Figure. In practical terms, it comprises of three IV estimates: (a) an IV model for the effect of endogenous DC plan participation on personal financial outcomes; (b) an IV model for the effect of endogenous DC plan participation on the candidate mediating variable; (c) an IV model for the effect of endogenous DC plan participation and the endogenous mediating variable on personal financial outcomes. The list of instrumental variables comprises of the two previous variables used, i.e., labour market entry post auto-enrolment, and retirement literacy.

The estimates of selected coefficients from the latter third model are shown in Table 6, i.e., for the effect of endogenous DC plan participation and the endogenous candidate mediator only[19]. The remaining specification is identical to that of the previous tables. For the ease of inspection of results, we are intuitively looking for an instrumented mediator that exerts a significant impact on the six personal financial management outcomes, while rendering the effect of instrumented DC-plan participation statistically insignificant. We present only the five dependent variables for which any of the six candidate mediators has been identified to play that role. These variables are shown in the respective columns of the table, and they are the following: (1) Relying on a pension only; (2) Continuing to work post-retirement; (3) Log(household savings); (4) Saving-to-income ratio, and; (5) Stock ownership[20].

[19] The Appendix Table 8 presents the estimates of the second stage of the causal mediation analysis, i.e., the IV regression in which the dependent variable is the candidate mediator, and the endogenous variable is DC plan participation. The two instruments used are again entry post auto-enrolment and retirement literacy.

[20] For the remaining seven dependent variables of Tables 4 and 5, no mediation effects were identified from either of the six candidate mediating variables. Moderation effects did exist. These results are available by the authors upon request.

In panel A, we observe that the effect of DC plans does not become insignificant when incorporating instrumented bequest motives in the specification. It exerts a moderating effect on savings, but there is no consistent pattern of mediation of the outcomes. In panel B, we notice stronger moderating effects of income, but again the effect of DC plans does not become insignificant in the causal mediation models. The only exception is the effect on savings on which household income appears to exert a likely mediating role[21]. In panel C, it is evident that behavioural factors such as present-biased behaviour exert a mediating role in three out of five outcomes, namely reliance on pensions only, savings, and the savings-to-income ratio. In panel D, professional advice does not appear to mediate the effect of DC plans on the five outcomes presented. Finally, in panels E and F, it is evident that using multiple information sources on money matters and financial literacy mediate all five outcomes of interest, as the effect of DC plans becomes insignificant in all models. We interpret these latter two findings as indicative of the importance of tax incentives and regulatory knowledge – approximated by the usage of a breadth of suitable information sources – and financial confidence and self-efficacy, in the form of financial literacy – for the transformation of DC-plan experience into active personal financial management and retirement capability.

[INSERT TABLE 6 ABOUT HERE]

5.2 Policy implications for international accounting, auditing and taxation

The increasing prominence of DC pension schemes raises significant considerations in accounting, auditing, and taxation, influencing both corporate practices and household financial behaviours. Comprix and Muller (2011) demonstrate how firms' pension accounting estimates, specifically during the transition from DB to DC plans, affect their financial disclosures and overall risk profiles. This accounting shift moves pension obligations from long-term liabilities to immediate expenses, enhancing transparency but necessitating more accurate and timely disclosures. Clark et al. (2012) further propose a new accounting approach addressing shortcomings in existing standards, with implications for household understanding and planning for

[21] As an additional candidate mediator for income stability, we use a dummy variable taking the value one if respondents suggested their household income varies somewhat or a lot week/ fortnight/month. The question was asking "Is your/your partner/spouse's income roughly the same every week fortnight month?". The results, which are available upon request, show that income fluctuation only moderates the logarithm of savings, but it does not act as a mediator.

long-term pension investments. Wang and Zhang (2014) emphasize how the financial risks associated with pension plans can significantly influence corporate bond ratings, thus directly impacting investor perceptions and household confidence in pension-related investment decisions.

Auditing practices face increased complexities with DC pension plans, as responsibility for investment decisions and pension risk transfers to individual plan participants. Chuk (2013) underscores the pivotal role of auditors in ensuring the accuracy of pension disclosures and maintaining trust in pension institutions. Effective auditing is critical not only for maintaining transparency and compliance but also for enhancing individuals' confidence in managing their long-term retirement assets. Maurer, et al. (2016) further highlight the importance of auditing in the actuarial smoothing of retirement payouts, which aids individuals in mitigating investment risks and enhancing financial security during retirement.

Taxation policies also profoundly shape retirement planning behaviours at the individual and household levels. Graham, et al. (2012) emphasize that pension accounting disclosures significantly influence stock prices, reflecting how taxation information shapes investor and household decisions regarding pension investments. Brown and Weisbenner (2004) discuss how changes in pension plan structures impact firm valuation due to taxation treatments, affecting both corporate and individual retirement investment strategies. Additionally, Kim, et al. (2016) find that rational lifecycle inertia, driven partly by taxation considerations, affects household decisions regarding delegation of pension investment management. Brown, et al. (2017) illustrate how cognitive constraints related to pension taxation complexities influence household annuity choices and long-term savings behaviours.

The evidence that tax incentives and regulatory knowledge significantly mediate the effectiveness of DC plans underscores the importance of enhanced transparency in international financial reporting standards (IFRS). Policymakers and standard-setters, including the International Accounting Standards Board (IASB), should consider improving disclosures related to tax benefits and pension regulations. Transparent financial reporting on DC pension plans would enable individuals to better understand and utilise these incentives, thus promoting informed financial decisions and optimal saving behaviours across jurisdictions.

Considering that financial confidence and self-efficacy, driven largely by financial literacy, mediate the effectiveness of DC plans, international auditing standards should explicitly address the adequacy of disclosures relating to pension plan investments. Auditors play a key role in verifying the clarity, completeness, and usefulness of financial information provided by entities offering DC plans. Therefore, international auditing bodies, such as the International Auditing and Assurance Standards Board (IAASB), could strengthen guidance on auditing pension-related disclosures, ensuring that these are accessible and meaningful for individual investors across different jurisdictions.

Given the pivotal role of financial literacy, tax authorities internationally should prioritise educational initiatives aimed at improving individuals' regulatory and taxation knowledge. Tax administrations globally could offer clear, accessible, and standardised information about tax reliefs and incentives associated with pension contributions. This initiative would not only promote tax compliance but also enhance taxpayers' ability to effectively engage with DC plans and maximise their benefits.

From a taxation perspective, international cooperation among tax authorities to simplify and harmonise pension-related tax incentives could significantly improve DC plan effectiveness. Complex or fragmented international tax regulations often hinder individuals' comprehension, reducing the effectiveness of DC plans in promoting optimal financial management behaviours. Thus, international taxation policymakers should consider coordinated efforts to streamline pension-related tax relief frameworks, supporting financial literacy, confidence, and ultimately wealth accumulation among participants.

Considering the implications of financial literacy and regulatory knowledge, international standard-setting bodies, such as the OECD, IASB, IFAC, and national regulatory authorities, should collaborate to develop consistent educational standards and best practices. Encouraging entities to disclose pension-related information in a uniform and easily understandable manner could help individuals worldwide make informed financial decisions, thereby enhancing overall retirement readiness. Consistent global accounting, auditing, and taxation guidelines would help ensure uniformity in pension-related disclosures, fostering financial literacy and strengthening personal financial management internationally.

Overall, these accounting, auditing, and taxation literatures collectively highlight critical factors influencing pension management, financial reporting transparency, and household retirement planning strategies, emphasizing the need for enhanced financial literacy, clear financial disclosures, effective auditing oversight, and strategic taxation incentives to support informed and sustainable retirement planning.

6. Concluding remarks

This study provides robust empirical evidence on the impact of defined-contribution (DC) pension plans on retirement planning and personal financial management under the UK's 2012 auto-enrolment reform. The findings highlight a significant shift away from reliance on pension income alone, with DC plan participants adopting diverse retirement financing strategies, both passive and more proactive, i.e., incorporating savings, stock investments, and real estate holdings. This behaviour aligns with lifecycle theory, suggesting that the policy has effectively encouraged proactive financial decision-making across different demographic groups, particularly among younger workers.

The regional and lifecycle analyses reinforce this conclusion. DC plan participants in Wales, West Midlands, South West, and London exhibit notably higher household savings, stock investments, and real estate holdings, indicating that the benefits of auto-enrolment extend beyond pension accumulation. The lifecycle analysis further reveals that younger and middle-aged DC participants are significantly less reliant on pensions alone and more engaged in diversified investment strategies, aligning with lifecycle financial planning principles. These results underscore how pension reform has redefined financial engagement across different population segments.

A key contribution of this study is its causal mediation analysis, which identifies financial literacy and the breadth of information sources used as critical mediators in transforming DC plan participation into active financial management and retirement preparedness. Additionally, behavioural attributes, particularly present bias, play a significant role in shaping some financial outcomes, reinforcing the importance of

psychological factors in retirement decision-making. Notably, professional financial advice alone does not significantly mediate these relationships, emphasizing the need for accessible regulatory knowledge and clear financial disclosures. These findings highlight the crucial role of tax incentives and financial education policies in enabling individuals to maximize the benefits of DC plans and enhance long-term financial security.

From an accounting perspective, the transition from DB to DC pension schemes simplifies financial reporting under IFRS (IAS 19: Employee Benefits), shifting pension obligations from long-term liabilities to immediate expenses. This change reduces balance sheet volatility and enhances financial statement transparency, reinforcing the need for accurate pension contribution reporting and fair value assessments. Similarly, auditing frameworks must evolve to ensure rigorous oversight of pension fund management, actuarial assumptions, and investment risks, thereby strengthening confidence in corporate pension disclosures.

From a taxation perspective, the UK's Exempt-Exempt-Taxed (EET) model remains a powerful incentive for retirement savings, but its effectiveness depends on clear communication of tax treatment at the withdrawal stage. The study highlights that regulatory clarity, streamlined tax policies, and international harmonization – such as standardized pension tax relief structures – could further enhance pension participation, savings behaviour, and household financial resilience.

Overall, this research underscores the importance of well-designed pension policies, financial education initiatives, and strong governance frameworks in improving individual financial security. Future policy interventions should prioritize financial literacy programs, transparent regulatory disclosures, and tax policy coordination to promote informed financial decision-making, reduce wealth disparities, and foster economic empowerment. Strengthening these elements will not only improve retirement readiness but also contribute to a more resilient and equitable financial landscape in the UK and beyond.

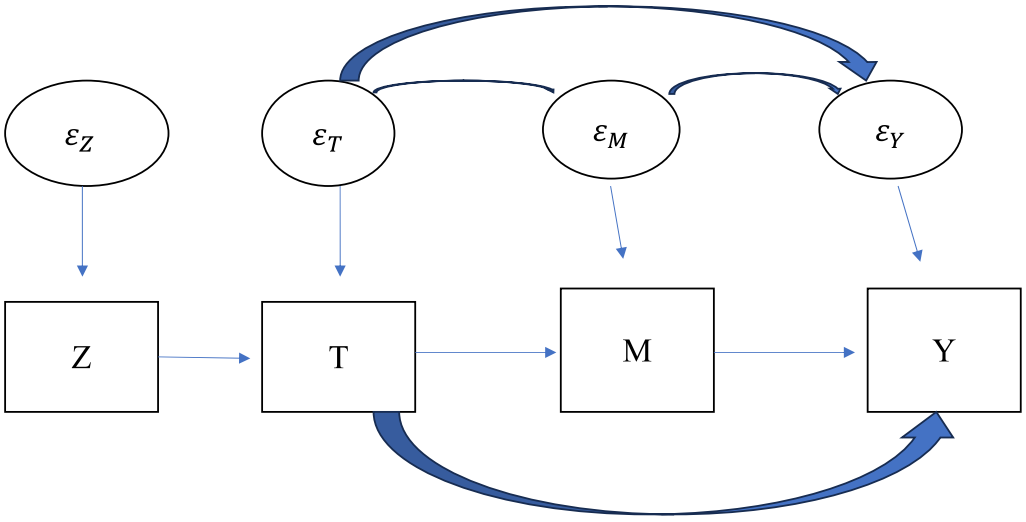

Figure 1
A description of causal mediation analysis

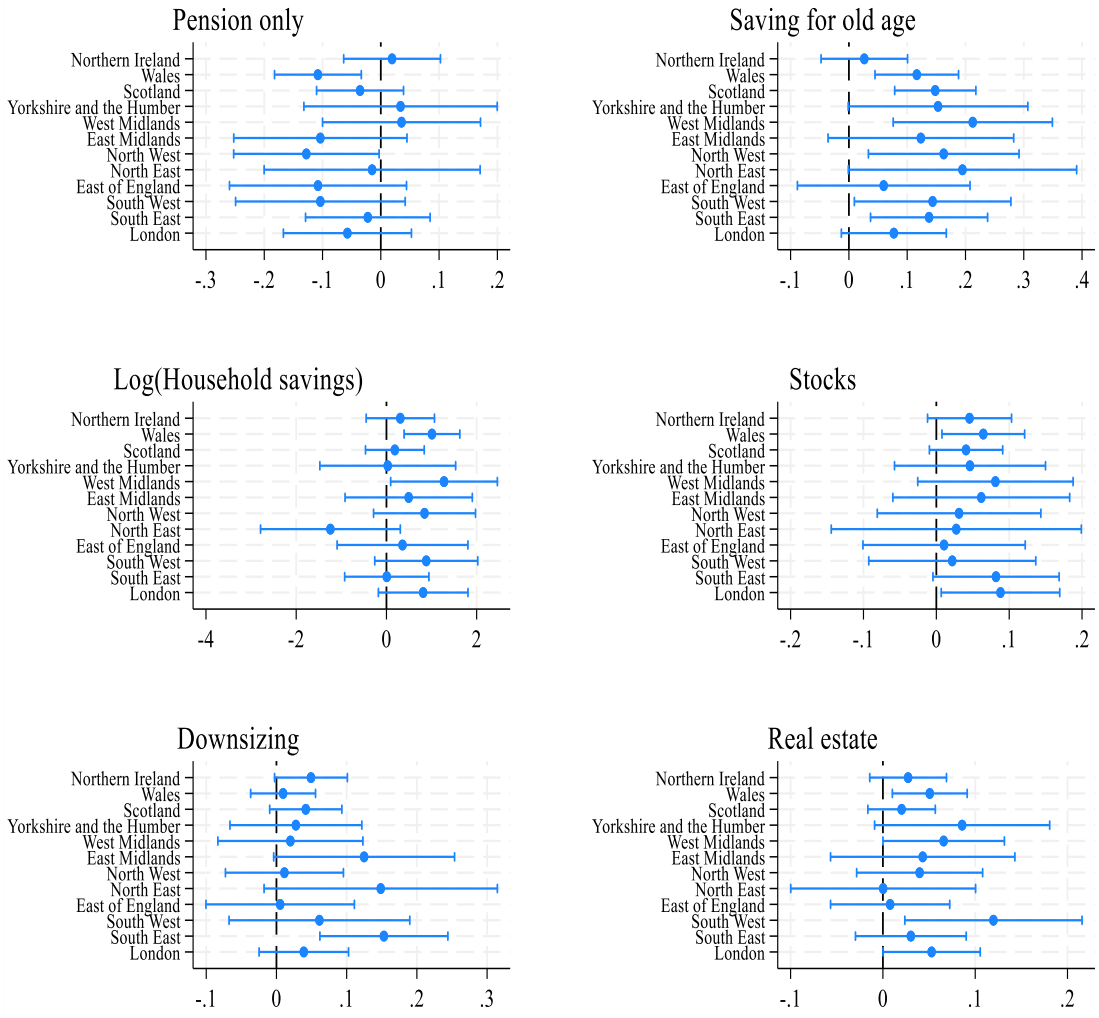

Figure 2

The effect of DC plan participation on personal financial behaviours across administrative regions

This figure illustrates the interaction effects of DC plan participation with regions on selected personal financial outcomes, namely: (1) relying only on a workplace or state pension plan for retirement; (2) saving for old age (dummy variable); (3) the logarithm of household savings; (4) owning stocks (dummy variable); (5) downsizing (dummy variable), and; (6) investing in real estate for retirement. The corresponding models are weighted instrumental variable (IV) models with correction for selection, with robust standard errors. The models are those of the Appendix Table 4, also including the interaction term between DC plan and the 12 administrative regions.

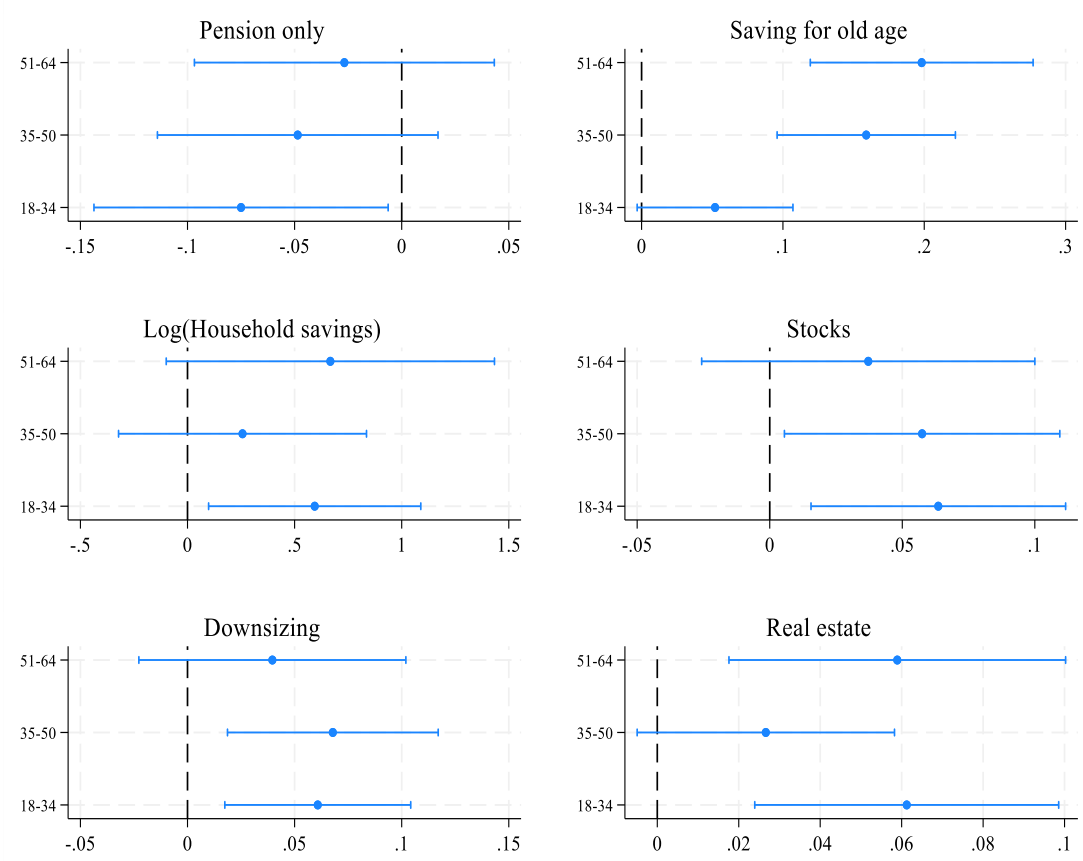

Figure 3

The effect of DC plan participation on personal financial behaviours across the lifecycle

This figure illustrates the interaction effects of DC plan participation with 3 age group categories on selected personal financial outcomes, namely: (1) relying only on a workplace or state pension plan for retirement; (2) saving for old age (dummy variable); (3) the logarithm of household savings; (4) owning stocks (dummy variable); (5) downsizing (dummy variable), and; (6) investing in real estate for retirement. The corresponding models are weighted instrumental variable (IV) models with correction for selection, with robust standard errors. The models are those of the Appendix Table 4, also including the interaction term between DC plan and the 3 age group dummy variables.

Table 1

Weighted averages

This table presents weighted averages for the variables used in the analysis. The sample comprises of working-age individuals aged 18–64 years and is representative of the four nations in the United Kingdom. Column 1 provides summary statistics for the pooled sample of 4,082 individuals, while columns 2–5 present data for individuals with DC pension plans, DB plans, both DC and DB plans, and those with no pension plans, respectively. The last two columns present weighted t-tests for differences between DC and DB pension planners. The asterisks denote the following levels of significance: ***: <0.01, **: <0.05, *: <0.1.

	Pooled	**DC**	**DB**	**Both**	**None**	**Diff.**	**Sig.**
#Observations	*4,082*	*1,421 (38.2%)*	*1,133 (25.1%)*	*292 (8.2%)*	*1,528 (37.7%)*	*DC vs. DB*	
	(1)	(2)	(3)	(4)	(5)	(6)	
Panel A: Demographic characteristics							
Age	39.65	41.14	42.95	45.82	35.84	-1.8149	***
Male	50.2%	54.4%	51.4%	68.9%	45.0%	0.0306	
Education: Postgraduate	17.4%	19.1%	22.2%	23.6%	12.4%	-0.0303	
-″-: University degree	20.7%	25.3%	19.5%	25.2%	16.7%	0.0585	**
-″-: Vocational	19.8%	20.4%	20.3%	22.6%	18.9%	0.0014	
-″-: Secondary	15.9%	14.7%	13.5%	10.9%	18.8%	0.0121	
-″-: Primary	18.2%	16.2%	18.5%	13.2%	20.2%	-0.0234	
-″-: No qualifications	7.3%	3.6%	5.2%	4.3%	12.5%	-0.0162	
Ethnicity: White	90.6%	91.5%	93.8%	92.1%	87.5%	-0.0224	
Marital status: Single	41.0%	37.2%	29.7%	23.9%	52.7%	0.0755	***
-″-: Married	49.8%	53.6%	59.1%	63.2%	39.5%	-0.0548	**
-″-: Widowed/Divorced	9.2%	9.2%	11.3%	12.9%	7.8%	-0.0207	
Number of children	0.71	0.74	0.73	0.80	0.66	0.0047	
Urbanisation: Large city	54.9%	52.8%	53.0%	52.9%	58.4%	-0.0019	
-″-: Small city	32.2%	33.1%	32.0%	33.1%	31.3%	0.0117	
-″-: Village	12.9%	14.0%	15.0%	14.0%	10.3%	-0.0097	
Home ownership: Outright	16.5%	14.4%	25.5%	17.6%	12.6%	-0.1109	***
-″-: Mortgage	41.9%	53.0%	45.7%	58.0%	27.8%	0.0729	**
Gross household income	28,369.8	34,853.0	31,326.3	35,442.5	19,611.8	3,526.6	**
Employment status: Employed	71.0%	85.1%	81.2%	87.8%	49.4%	0.0380	*
-″-: Self-employed	7.9%	6.0%	6.9%	6.5%	10.6%	-0.0089	
-″-: Unemployed	4.9%	2.2%	2.8%	2.1%	9.2%	-0.0060	
-″-: Student	6.8%	1.8%	1.7%	1.0%	15.5%	0.0009	
-″-: Homemaker	6.8%	3.9%	5.2%	2.4%	10.9%	-0.0131	
England	83.5%	83.6%	79.9%	84.6%	85.9%	0.0371	***
Scotland	8.7%	9.7%	10.5%	9.6%	6.5%	-0.0074	
Wales	4.9%	4.4%	6.1%	3.7%	4.6%	-0.0174	***
Northern Ireland	2.9%	2.2%	3.5%	2.1%	3.1%	-0.0123	***
Panel B: Personal financial outcomes							
Dependent on pensions only	30.1%	25.1%	31.7%	19.0%	34.3%	-0.0661	***
#Retirement financing sources	2.20	2.79	2.58	2.91	1.33	0.2092	**
Dependent on partner's pension	15.6%	24.0%	21.9%	29.7%	2.5%	0.0210	
Dependent on work salary	10.0%	13.8%	11.7%	15.5%	5.0%	0.0210	
Pension investing	32.3%	49.8%	39.7%	49.5%	8.9%	0.1005	***
Pension investing in liquid assets	28.8%	44.6%	34.8%	44.9%	8.3%	0.0977	***
Pension investing in illiquid assets	12.3%	20.1%	15.1%	19.4%	2.2%	0.0495	**
Household savings	9,979.0	12,160.6	12,916.1	13,878.1	5,703.5	-755.5	
Savings to income ratio	0.193	0.206	0.229	0.222	0.155	-0.0236	*
Save for old age	24.1%	36.7%	32.5%	44.5%	5.4%	0.0416	
Stockholding	12.7%	18.2%	13.4%	24.2%	6.3%	0.0479	**
Downsizing	9.1%	14.8%	12.1%	13.7%	1.3%	0.0272	
Real estate	4.4%	7.9%	4.0%	8.9%	1.2%	0.0380	***

Table 1 continued in the next page

Table 1 continued from the last page

	(1)	(2)	(3)	(4)	(5)	(2) vs. (3)
Panel C: Instrumental variables and additional candidate mediators						
Entry post auto-enrolment	28.1%	27.4%	22.8%	11.6%	32.5%	0.0461*
Retirement literacy	0.626	0.877	0.615	0.976	0.372	0.2626***
Bequest motives	41.0%	43.1%	43.2%	46.6%	37.5%	-0.0011
Present bias	3.515	3.34	3.189	3.126	3.921	0.1514
Professional advice	25.2%	24.1%	26.7%	27.5%	25.4%	-0.0261
#Information sources	1.883	2.184	2.073	2.173	1.44	0.1115
Financial literacy	1.501	1.793	1.614	1.812	1.12	0.1791***

Table 2

First stage results from a Heckman probit model: Pension-plan participation in the UK

This table presents marginal effects from weighted probit regressions, corresponding to the first stage of the Heckman selection model. The dependent variable is a dummy variable for pension plan participation in the UK. Robust standard errors are reported in brackets. All models include fixed effects for 12 administrative regions. The estimates in column 1 control for the exclusion criterion of the second stage, namely being in paid employment. In column 2 we incorporate the first instrumental variable of the later 3-stage model, namely entry in employment post the auto-enrolment reform. In column 3 we incorporate the second instrument, namely retirement literacy. In column 4 we incorporate both the exclusion criterion and the two instruments. The asterisks denote the following levels of significance: ***: <0.01, **: <0.05, *: <0.1.

	(1)	(2)	(3)	(4)
Exclusion restriction: In paid employment	0.217***	0.212***	0.205***	0.200***
	[0.021]	[0.021]	[0.020]	[0.020]
IV_1: $Entrant_{Post\ auto\text{-}enrolment}$	–	0.105***	–	0.095***
		[0.028]		[0.028]
IV_2: Retirement literacy	–	–	0.122***	0.121***
			[0.012]	[0.012]
Age	0.006***	0.008***	0.005***	0.007***
	[0.001]	[0.001]	[0.001]	[0.001]
Male	0.033*	0.036*	0.012	0.014
	[0.020]	[0.019]	[0.019]	[0.019]
Present orientation	-0.013***	-0.013***	-0.010***	-0.010***
	[0.004]	[0.004]	[0.004]	[0.004]
Education: Postgraduate	0.226***	0.225***	0.169***	0.169***
	[0.045]	[0.045]	[0.044]	[0.045]
-"-: Undergraduate	0.214***	0.213***	0.167***	0.166***
	[0.042]	[0.042]	[0.041]	[0.042]
-"-: Vocational	0.113***	0.117***	0.076*	0.080**
	[0.040]	[0.040]	[0.039]	[0.039]
-"-: Secondary	0.117***	0.119***	0.080*	0.082*
	[0.043]	[0.044]	[0.042]	[0.043]
-"-: Primary	0.072*	0.071*	0.062	0.061
	[0.040]	[0.040]	[0.039]	[0.039]
-"-: None/Incomplete	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
White	0.019	0.019	0.016	0.016
	[0.037]	[0.037]	[0.036]	[0.036]
Marital status: Single	-0.009	-0.008	-0.005	-0.005
	[0.026]	[0.025]	[0.025]	[0.025]
-"-: Married	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Widowed/Divorced	0.057*	0.056	0.059*	0.058*
	[0.035]	[0.034]	[0.033]	[0.033]
Number of children	0.001	0.005	-0.004	0.001
	[0.011]	[0.011]	[0.011]	[0.011]
Log(household income)	-0.284	-0.249	-0.408*	-0.374
	[0.235]	[0.235]	[0.229]	[0.228]
$Log(household\ income)^2$	0.035	0.03	0.054	0.049
	[0.034]	[0.034]	[0.033]	[0.033]
$Log(household\ income)^3$	-0.001	-0.001	-0.002	-0.002
	[0.001]	[0.001]	[0.001]	[0.001]
Home ownership: Outright	0.037	0.034	0.031	0.028
	[0.026]	[0.026]	[0.025]	[0.025]
-"-: Mortgage	0.077***	0.080***	0.072***	0.074***
	[0.024]	[0.024]	[0.023]	[0.023]
-"-: None	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
Urbanity: Large city	-0.038*	-0.035	-0.042*	-0.040*
	[0.023]	[0.023]	[0.022]	[0.022]

Table 2 continued in the next page

Table 2 continued from the last page

	(1)	(2)	(3)	(4)
-"-: Small city/suburbs	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Village	-0.005	-0.003	-0.011	-0.01
	[0.031]	[0.031]	[0.030]	[0.030]
% Employee effect	*39.3%*	*38.2%*	*37.0%*	–
%Entry$_{Post\ auto\text{-}enrolment}$ effect	–	*18.9%*	*22.1%*	*36.2%*
% Retirement-literacy effect	–	–	*22.0%*	*21.8%*
Predicted probability	*0.5541*	*0.5543*	*0.5536*	*0.5539*
No. of observations	*4,082*	*4,082*	*4,082*	*4,082*

Table 3

Second stage results from a Heckman probit model: DC-plan participation in the UK

This table presents the marginal effects from weighted second-stage probit regressions, correcting for selection into any pension plan, via the incorporation of the inverse Mills ratio from the first stage calculated in the model shown in column 4 of Table 1. The second-stage dependent variable is DC plan participation in the United Kingdom. All models include fixed effects for 12 administrative regions. Robust standard errors are reported in brackets. In the mode l of column 1 we incorporate the first instrumental variable, namely labour market entry after the pension auto-enrolment reform. In the model of column 2 we incorporate the second instrumental variable, namely retirement literacy. In the model of column 3 we incorporate both instrumental variables simultaneously. The asterisks denote the usual levels of significance.

	(1)	(2)	(3)
IV_1 : $Entrant_{Post\ auto\text{-}enrolment}$	0.264***	–	0.252***
	[0.087]		[0.088]
IV_2: Retirement literacy	–	0.364***	0.362***
		[0.039]	[0.039]
Inverse Mills ratio	0.258***	0.379***	0.387***
	[0.054]	[0.055]	[0.055]
Age	0.020***	0.012***	0.018***
	[0.004]	[0.003]	[0.004]
Male	0.182***	0.094	0.099
	[0.060]	[0.061]	[0.061]
Present orientation	-0.014	-0.008	-0.007
	[0.012]	[0.012]	[0.012]
Education: Postgraduate	0.581***	0.429***	0.428***
	[0.139]	[0.143]	[0.143]
-"-: Undergraduate	0.712***	0.579***	0.580***
	[0.131]	[0.134]	[0.134]
-"-: Vocational	0.469***	0.335***	0.345***
	[0.125]	[0.128]	[0.129]
-"-: Secondary	0.440***	0.318**	0.325**
	[0.134]	[0.138]	[0.138]
-"-: Primary	0.326***	0.292**	0.289**
	[0.126]	[0.128]	[0.129]
-"-: None/Incomplete	{*Ref.*}	{*Ref.*}	{*Ref.*}
White	-0.017	-0.04	-0.04
	[0.110]	[0.112]	[0.112]
Marital status: Single	0.136*	0.139*	0.140*
	[0.078]	[0.079]	[0.079]
-"-: Married	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Widowed/Divorced	0.14	0.175	0.176
	[0.110]	[0.109]	[0.108]
Number of children	0.014	-0.015	-0.005
	[0.034]	[0.034]	[0.034]
Log(household income)	-2.302***	-2.711***	-2.607***
	[0.764]	[0.766]	[0.771]
$Log(household\ income)^2$	0.307***	0.369***	0.355***
	[0.110]	[0.110]	[0.111]
$Log(household\ income)^3$	-0.012**	-0.015***	-0.014***
	[0.005]	[0.005]	[0.005]
Home ownership: Outright	-0.195**	-0.192**	-0.201**
	[0.081]	[0.083]	[0.083]
-"-: Mortgage	0.239***	0.228***	0.235***
	[0.073]	[0.073]	[0.073]
-"-: None	{*Ref.*}	{*Ref.*}	{*Ref.*}
Urbanity: Large city	-0.103	-0.129*	-0.124*
	[0.071]	[0.071]	[0.072]

Table 3 continued in the next page

Table 3 continued from the last page

	(A$_1$)	(B$_1$)	(C$_1$)
-"-: Small city/suburbs	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Village	-0.014	-0.052	-0.048
	[0.096]	[0.096]	[0.097]
% IV$_1$ effect	*69.1%*	*–*	*66.0%*
% IV$_2$ effect	*–*	*95.4%*	*95.0%*
Predicted probability	*0.3817*	*0.3813*	*0.3813*
No. of observations	*4,082*	*4,082*	*4,082*

Table 4

Third stage results from endogenous treatment-effect models with correction for selection: Retirement planning in the UK

This table presents estimates from weighted maximum-likelihood likelihood of the third stage of endogenous-treatment models regarding retirement-planning strategies in the UK. Robust standard errors are shown in brackets. To account for sample selection, all specifications incorporate the inverse Mills ratio calculated at the first stage of the model shown in column 4 of Table 2. The endogeneity of DC plan participation is accounted for in the second stage of the model shown in column 3 of Table 3. All 7 specifications incorporate fixed effects for the 12 administrative regions of the UK. The dependent variables in each column are the following: (1) A dummy variable for reliance solely on a workplace, personal or state pension for retirement; (2) A continuous variable for the number of retirement-financing sources, ranging between 0 and 7; (3) A dummy variable for reliance on a partner's pension for retirement, apart from own pension; (4) A dummy variable for planning to continuing to work after retirement, apart from receiving own pension; (5) A dummy variable for ownership of financial assets, other than own pension, namely savings, investments or real estate; (6) A dummy variable for ownership of liquid assets, other than own pension, namely savings or investments; (7) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release or buy-to-let or other income from a property which is not the primary residence. The asterisks denote the usual levels of significance.

	Pension only	***#Retirement fin. sources***	***Partner's pension***	***Continue to work***	***Pension & fin. assets***	***Pension & liquid assets***	***Pensions & illiquid assets***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DC plan	-0.212***	2.292***	0.145***	0.245**	0.539**	0.460***	0.182***
	[0.074]	[0.255]	[0.042]	[0.111]	[0.210]	[0.113]	[0.041]
Inverse Mills ratio	0.059***	-0.111*	0.008	-0.030*	-0.006	-0.007	-0.016
	[0.019]	[0.063]	[0.012]	[0.015]	[0.025]	[0.019]	[0.012]
Age	-0.003**	0.014***	0.001	-0.001	0.001	0.001	0.001*
	[0.001]	[0.003]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Male	0.004	-0.099	-0.056***	0.036**	-0.018	-0.004	-0.027*
	[0.021]	[0.068]	[0.016]	[0.015]	[0.023]	[0.020]	[0.015]
Present orientation	0.010**	-0.057***	-0.004	-0.003	-0.024***	-0.023***	-0.006**
	[0.004]	[0.014]	[0.003]	[0.003]	[0.004]	[0.004]	[0.003]
Education: Postgraduate	-0.021	0.342**	0.009	0.003	0.047	0.072*	0.006
	[0.047]	[0.145]	[0.027]	[0.037]	[0.055]	[0.043]	[0.030]
-"-: Undergraduate	-0.024	0.505***	0.067**	0.027	0.140**	0.158***	0.043
	[0.046]	[0.139]	[0.026]	[0.038]	[0.062]	[0.043]	[0.030]
-"-: Vocational	0.013	0.243**	0.059**	-0.017	0.027	0.034	-0.008
	[0.043]	[0.122]	[0.023]	[0.028]	[0.045]	[0.035]	[0.026]
-"-: Secondary	0.027	0.287**	0.034	-0.001	0.055	0.075*	0.022
	[0.045]	[0.135]	[0.025]	[0.031]	[0.048]	[0.039]	[0.029]
-"-: Primary	0.022	0.102	0.024	-0.016	-0.002	0.033	-0.038
	[0.043]	[0.116]	[0.022]	[0.026]	[0.039]	[0.032]	[0.024]
-"-: None/Incomplete	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
White	-0.001	0.07	0.014	-0.005	0.035	0.02	-0.01
	[0.035]	[0.117]	[0.024]	[0.026]	[0.035]	[0.033]	[0.024]
Marital status: Single	0.062**	-0.015	-0.078***	0.002	0.034	0.049**	0.022
	[0.027]	[0.087]	[0.020]	[0.018]	[0.027]	[0.025]	[0.019]
-"-: Married	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Widowed/Divorced	0.046	-0.2	-0.137***	0.017	0.02	0.013	0.02
	[0.037]	[0.127]	[0.025]	[0.027]	[0.040]	[0.036]	[0.030]
Number of children	-0.004	-0.003	-0.006	-0.005	-0.031***	-0.031***	0.001
	[0.011]	[0.037]	[0.010]	[0.008]	[0.011]	[0.010]	[0.009]
Log(household income)	-0.644***	1.610**	0.478***	0.470**	0.363	0.34	0.112
	[0.227]	[0.774]	[0.157]	[0.190]	[0.243]	[0.212]	[0.147]
Log(household income)^2	0.088***	-0.243**	-0.076***	-0.066**	-0.056	-0.053*	-0.018
	[0.033]	[0.113]	[0.023]	[0.027]	[0.035]	[0.031]	[0.022]
Log(household income)^3	-0.004**	0.011**	0.004***	0.003**	0.003*	0.003*	0.001
	[0.001]	[0.005]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]

Table 4 continued in the next page

Table 4 continued from the last page

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Home ownership: Outright	-0.109***	0.395***	0.043**	0.006	0.116***	0.104***	0.072***
	[0.026]	[0.090]	[0.020]	[0.020]	[0.030]	[0.027]	[0.017]
-"-: Mortgage	-0.055**	0.306***	0.050***	-0.033*	0.085***	0.043*	0.124***
	[0.027]	[0.087]	[0.019]	[0.019]	[0.030]	[0.025]	[0.018]
-"-: None	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
Urbanity: Large city	-0.023	-0.008	-0.013	-0.012	-0.024	-0.026	-0.004
	[0.024]	[0.080]	[0.019]	[0.017]	[0.025]	[0.024]	[0.018]
-"-: Small city/suburbs	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Village	-0.035	0.092	-0.013	0.023	0.033	0.016	0.023
	[0.031]	[0.112]	[0.028]	[0.023]	[0.034]	[0.032]	[0.027]
% DC-plan effect	*-70.5%*	*104.2%*	*93.4%*	*244.5%*	*167.0%*	*159.4%*	*147.7%*
Linear prediction	*0.3013*	*2.1995*	*0.1556*	*0.1001*	*0.3225*	*0.2884*	*0.1229*
No. of observations	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*

Table 5

Third stage results from endogenous treatment-effect models with correction for selection: Retirement financing in the UK

This table presents estimates from weighted maximum-likelihood likelihood of the third stage of endogenous-treatment models regarding retirement-financing sources in the UK. Robust standard errors are shown in brackets. To account for sample selection, all specifications incorporate the inverse Mills ratio calculated at the first stage of the model shown in column 4 of Table 2. The endogeneity of DC plan participation is accounted for in the second stage of the model shown in column 3 of Table 3. All 6 specifications incorporate fixed effects for the 12 administrative regions of the UK. The dependent variables in each column are the following: (1) A continuous variable for the logarithm of the amount in household savings; (2) A continuous variable for the savings to income ratio of the household; (3) A dummy variable for saving for old age; (4) A dummy variable for ownership of stocks; (5) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release; (6) A dummy variable for ownership of illiquid assets, other than own pension, namely buy-to-let or other income from a property which is not the primary residence. The asterisks denote the usual levels of significance.

	Log (Savings)	**Savings to income**	**Saving for old age**	**Stocks**	**Downsizing**	**Real estate**
	(1)	(2)	(3)	(4)	(5)	(6)
DC plan	3.551***	0.347***	0.297***	0.137***	0.112***	0.072***
	[0.500]	[0.023]	[0.064]	[0.043]	[0.032]	[0.023]
Inverse Mills ratio	-0.039	-0.023**	0.027*	-0.022*	0.001	-0.014*
	[0.146]	[0.011]	[0.016]	[0.012]	[0.010]	[0.008]
Age	-0.012	0.001	0.006***	0.002***	0.002**	0.001
	[0.008]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Male	0.077	-0.002	-0.024	0.034**	-0.029**	0.009
	[0.161]	[0.013]	[0.018]	[0.015]	[0.013]	[0.009]
Present orientation	-0.218***	-0.013***	-0.025***	-0.013***	-0.002	-0.005***
	[0.032]	[0.003]	[0.003]	[0.003]	[0.003]	[0.002]
Education: Postgraduate	1.166***	0.038	0.055	0.051*	0.002	0.024
	[0.381]	[0.030]	[0.035]	[0.030]	[0.027]	[0.018]
-"-: Undergraduate	0.847**	-0.003	0.117***	0.035	0.03	0.013
	[0.383]	[0.030]	[0.033]	[0.027]	[0.026]	[0.017]
-"-: Vocational	0.388	-0.032	0.103***	0.024	-0.001	-0.007
	[0.346]	[0.027]	[0.029]	[0.024]	[0.022]	[0.013]
-"-: Secondary	0.732**	-0.007	0.083***	0.024	0.03	-0.004
	[0.368]	[0.028]	[0.031]	[0.028]	[0.026]	[0.014]
-"-: Primary	0.655*	0.001	0.056**	-0.035*	-0.042**	0.014
	[0.348]	[0.027]	[0.027]	[0.020]	[0.021]	[0.014]
-"-: None/Incomplete	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
White	0.01	0.032	0.057**	-0.079***	0.040**	-0.055**
	[0.256]	[0.020]	[0.026]	[0.029]	[0.016]	[0.022]
Marital status: Single	-0.008	0.007	0.003	0.001	0.019	0.006
	[0.207]	[0.017]	[0.023]	[0.018]	[0.018]	[0.011]
-"-: Married	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Widowed/Divorced	-0.089	-0.018	0.002	0.009	0.02	-0.004
	[0.312]	[0.025]	[0.034]	[0.026]	[0.028]	[0.016]
Number of children	-0.046	-0.003	-0.031***	-0.004	0.002	-0.005
	[0.095]	[0.008]	[0.010]	[0.008]	[0.008]	[0.005]
Log(household income)	8.992***	0.564***	0.608***	0.512***	0.111	0.124
	[1.672]	[0.137]	[0.187]	[0.149]	[0.125]	[0.107]
Log(household income)^2	-1.231***	-0.077***	-0.096***	-0.081***	-0.016	-0.021
	[0.244]	[0.020]	[0.028]	[0.022]	[0.019]	[0.016]
Log(household income)^3	0.054***	0.003***	0.005***	0.004***	0.001	0.001
	[0.011]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Home ownership: Outright	2.090***	0.170***	0.085***	0.110***	0.057***	0.013
	[0.215]	[0.017]	[0.024]	[0.022]	[0.016]	[0.011]

Table 5 continued in the next page

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	(1)	(2)	(3)	(4)	(5)	(6)
-"-: Mortgage	0.674***	0.029**	0.038	-0.009	0.177***	0.177***
	[0.144]	[0.014]	[0.028]	[0.016]	[0.021]	[0.021]
-"-: None	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
Urbanity: Large city	0.441**	0.032**	-0.022	-0.011	0.001	-0.009
	[0.190]	[0.015]	[0.021]	[0.016]	[0.016]	[0.011]
-"-: Small city/suburbs	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Village	0.212	0.017	0.021	0.012	0.029	-0.002
	[0.258]	[0.021]	[0.030]	[0.024]	[0.025]	[0.015]
DC-plan effect	*£3,484.8*	*179.6%*	*122.9%*	*108.3%*	*122.9%*	*161.4%*
Linear prediction	*6.1135*	*0.193*	*0.2413*	*0.1266*	*0.0914*	*0.0444*
No. of observations	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*

Table 6

Causal mediation analysis – IV regressions with two endogenous variables and correction for selection

This table presents the estimates from the causal mediation analysis described in figure 1 for selected retirement financial outcomes of tables 4 and 5. Coefficients are robust standard errors are reported in brackets, with the asterisks denoting the usual levels of significance. The estimates are third-stage IV models with correction for selection and two endogenous variables, namely DC-plan participation and the mediating variable. Four mediating variables are examined – one at a time in each panel – regarding the effect of DC plan participation of retirement strategies and financing sources: bequests, professional (retirement or financial) advice, information sources and financial literacy. The dependent variables in each column are the following: (1) A dummy variable for reliance solely on a workplace, personal or state pension for retirement; (2) A dummy variable for planning to continuing to work after retirement, apart from receiving own pension; (3) A continuous variable for the logarithm of the amount in household savings; (4) A continuous variable for the savings-to-income ratio; (5) A dummy variable for ownership of stocks; (The remaining specification is identical to that the Appendix Table 4. In Panel A, we omit the number of children from the list of control variables. In panel B, we omit the polynomial in log(household income). In panel C, we omit the dummy variable for present bias.

	Pension only	**Continue to work**	**Log (Savings)**	**Savings-to-income ratio**	**Stock ownership**
Panel A:	(A_1)	(A_2)	(A_3)	(A_4)	(A_5)
$Mediator_1$: Bequests	-0.092	0.106	2.072*	0.129	0.256*
	[0.176]	[0.125]	[1.239]	[0.092]	[0.134]
DC plan	-0.053**	0.053***	0.365**	0.017	0.052***
	[0.021]	[0.015]	[0.155]	[0.012]	[0.017]
Mediation effect	–	–	–	–	–
Panel B:	(B_1)	(B_2)	(B_3)	(B_4)	(B_5)
$Mediator_2$: Log(household income)	-0.106	0.046	1.908***	0.042	0.020
	[0.070]	[0.047]	[0.576]	[0.037]	[0.046]
DC plan	0.007	0.028	-0.292	-0.019	0.056*
	[0.045]	[0.028]	[0.361]	[0.022]	[0.030]
Mediation effect	–	–	*106.5%*	–	–
Panel C:	(C_1)	(C_2)	(C_3)	(C_4)	(C_5)
$Mediator_3$: Present bias	0.173*	-0.110	-2.705**	-0.151**	-0.144*
	[0.092]	[0.068]	[1.089]	[0.065]	[0.075]
DC plan	-0.033	0.040**	0.071	0.001	0.038*
	[0.029]	[0.019]	[0.323]	[0.019]	[0.022]
Mediation effect	*88.6%*	–	*98.2%*	*99.7%*	–
Panel D	(D_1)	(D_2)	(D_3)	(D_4)	(D_5)
$Mediator_4$: Professional advice	-0.779**	0.429	10.675***	0.566**	0.355
	[0.390]	[0.284]	[4.052]	[0.259]	[0.287]
DC plan	-0.070***	0.063***	0.616**	0.030*	0.062***
	[0.027]	[0.019]	[0.276]	[0.018]	[0.018]
Mediation effect	–	–	–	–	–
Panel E	(E_1)	(E_2)	(E_3)	(E_4)	(E_5)
$Mediator_5$: #Information sources	-0.154**	0.098**	2.304***	0.126***	0.113**
	[0.072]	[0.050]	[0.694]	[0.045]	[0.057]
DC plan	-0.008	0.025	-0.302	-0.020	0.021
	[0.032]	[0.020]	[0.289]	[0.018]	[0.023]
Mediation effect	*97.3%*	*87.0%*	*108.3%*	*110.1%*	*89.6%*
Panel F	(F_1)	(F_2)	(F_3)	(F_4)	(F_5)
$Mediator_6$: Financial literacy	-0.117**	0.082*	1.854***	0.104***	0.111**
	[0.058]	[0.043]	[0.463]	[0.033]	[0.049]
DC plan	-0.018	0.029	-0.174	-0.013	0.021
	[0.027]	[0.019]	[0.202]	[0.014]	[0.022]
Mediation effect	*93.4%*	*84.6%*	*104.8%*	*106.8%*	*89.4%*
No. of observations	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*

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Appendix Table 1

Variable description for the UK Financial Capability Survey 2018

This table presents the variable definitions for the main dependent and independent variables on retirement finances used in the empirical analysis based on the definitions provided by the Financial Capability Survey of 2018 in the United Kingdom.

Variable name	Definition
No pension plan	Thinking about all the years you've paid into a pension, have these been: – Not applicable/ I have never paid in
DC plan	Thinking about all the years you've paid into a pension, have these been: – All or mostly defined contributions
DB plan	Thinking about all the years you've paid into a pension, have these been: – All or mostly defined benefits
DC & DB plan	Thinking about all the years you've paid into a pension, have these been: – A mix of both defined contributions and defined benefits
Pension only	Which, if any, of the following are you expecting to use to pay for your retirement? 1) State pension OR 2) Personal or workplace pension
#Pension sources	Which, if any, of the following are you expecting to use to pay for your retirement? 1) State pension; 2) Personal or workplace pension; 3) Your partner's/spouse's personal or workplace pension; 4) Savings or investments; 5) Income from work; 6) Downsizing your home or equity release; 7) Buy-to-let or other income from a property that is not your main home.
Continue to work	Which, if any, of the following are you expecting to use to pay for your retirement? 2) Personal or workplace pension AND 5) Income from work
Partner's pension	Which, if any, of the following are you expecting to use to pay for your retirement? 2) Personal or workplace pension AND 3) Your partner's/spouse's personal or workplace pension.
Pension & fin. assets	Which, if any, of the following are you expecting to use to pay for your retirement? 2) Personal or workplace pension AND [4) Savings or investments OR 6) Downsizing your home or equity release OR 7) Buy-to-let or other income from a property that is not your main home].
Pensions & liquid assets	Which, if any, of the following are you expecting to use to pay for your retirement? 2) Personal or workplace pension AND 4) Savings or investments.
Pensions & illiquid assets	Which, if any, of the following are you expecting to use to pay for your retirement? 2) Personal or workplace pension AND [6) Downsizing your home or equity release OR 7) Buy-to-let or other income from a property that is not your main home].
Household savings	Amount of household savings
Savings-to-income ratio	Ratio of total household savings to household income
Saving for old age	Which, if any, of the following are you expecting to use to pay for your retirement? 2) Personal or workplace pension AND [Which, if any, of these financial goals do you have for the next five years?: Saving money for retirement AND/OR What planned expenses, purchases or events are you saving for?: Retirement]
Stocks	Do you currently have savings or investments in any of the following? In investments/stocks & shares
Downsizing	Which, if any, of the following are you expecting to use to pay for your retirement? 6) Downsizing your home or equity release
Real estate	Which, if any, of the following are you expecting to use to pay for your retirement? 7) Buy-to-let or other income from a property that is not your main home
$Entrant_{Post\ auto\text{-}enrolment}$	a dummy variable indicating whether the individual began contributing to a pension plan after the introduction of the auto-enrolment legislation. Specifically, it captures those who started contributing post-2012 and meet the criteria stipulated by the policy, including being older than 22 years and earning an annual income exceeding £10,000.

Appendix Table 1 continued in the next page

Appendix Table 1 continued from the last page

Variable name	Definition
Retirement literacy	Retirement knowledge score, ranging between 0 and 2, based on the number of correct responses in the following two questions: *(1) John has a pension where: (a) he pays 4% of his salary; (b) the government pays 1% through tax relief; (c) his employer pays 5%. When he retires, the income he receives will depend on how much his pot is worth. How the stock market has performed will make a difference to his retirement income. As far as you know, is this type of pension… 1. Defined Contribution (DC); 2. Defined Benefit (DB); 3. I really have no idea at all* *(2) Janet has a pension where: (a) she pays 6% of her salary; (b) her employer pays whatever is needed to ensure the retirement income is paid according to the formula. When she retires, she will receive a pension that is based on the average of her salary throughout the time she was working. As far as you know, is this type of pension…. 1. Defined Contribution (DC) 2. Defined Benefit (DB) 3. I really have no idea at all*
Bequest motive	#Children>0
Household income	Continuous variable, transformed via using mid-points from the following ranges: Which band from the grid below does your household's total gross income from all sources fall into? *INCOME is any money from work, including a second job or occasional work, and any other sources, such as benefits, pensions, savings and investments, maintenance payments and rent from property or subletting. GROSS means the amount you receive before any deductions, income tax, National Insurance etc. If you don't know exactly, your best guess is fine.* 1. < £4,500; 2. £4,500 - £6,499; 3. £6,500 - £7,499; 4. £7,500 - £9,499; 5. £9,500 - £11,499; 6. £11,500 - £13,499; 7. £13,500 - £15,499; 8. £15,500 - £17,499; 9. £17,500 - £19,999; 10. £20,000 - £24,999; 11. £25,000 - £29,999; 12. £30,000 - £34,999; 13. £35,000 - £39,999; 14. £40,000 - £49,999; 15. £50,000 - £74,999; 16. £75,000 - £99,999; 17. >£100,000.
Present bias	"When it comes to money, I focus on the long term". 0 "Sounds a lot like me"; 1; 2; 3; 4; 5; 6; 7; 8; 9; 10 "Does not sound like me at all"
Professional advice	Over the last 12 months have you done any of these ..?: 1) Spoken to a regulated financial adviser (IFA) about retirement planning, 2) Contacted PensionWise or the Pensions Advisory Service (TPAS) AND Is consulting an advice organisation about debt something.....?: 1) Already doing, 2) You are planning to do soon, 3) You are thinking about doing in the future
Information sources	Which of the following sources of information have you used in the last year to find out about anything to do with money – whether that is how to budget or plan your finances, the best insurance, banking or credit products available, how to claim benefits or grants, or to get any help or advice, etc. PLEASE SELECT ALL THAT APPLY. 1. Family / Friends; 2. Financial Pages in Newspapers/Magazines; 3. Bank / Insurance Company; 4. Broker/ Professional Advisor; 5. Internet – Price Comparison Websites e.g. GoCompare, Moneysupermarket, Comparethemarket, Confused etc.; 6. Internet – General Sites or Searches e.g. Google, Yahoo, BBC etc.; 7. Internet – Specialist Site e.g. moneysavingexpert.com; 8. Government/ Non-Government Funded Org's (e.g. Citizens Advice / CAB); 9. Other.
Financial Literacy	Financial literacy score, ranging between 0 and 3, based on number of correct responses in 3 questions on: 1) Interest; 2) Compound interest calculation; 3) Inflation; - Suppose you put £100 into a savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made? ENTER AMOUNT; OR Don't know. - And how much would be in the account at the end of five years (remembering there are no fees or tax deductions). Would it be..?; 1. More than £110; 2. Exactly £110; 3. Less than £110; 4. Or is it impossible to tell from the information given; 5. Don't know - If the inflation rate is 5% and the interest rate you get on your savings is 3%, will your savings have more, less or the same amount of buying power in a year's time? 1. More; 2. The same; 3. Less 4; Don't know.

Appendix Table 2

Weighted pairwise correlation matrix

The asterisks denote the following levels of significance: *: <0.05.

	DC plan	Pension only	#Pension sources	Partner's pension	Continue to work	Pension & investments	Pension & liquid assets	Pension & illiquid assets	Household savings	Savings to income	Saving for old age	Stocks	Downsizing	Real estate	Entrant post auto-enrolment	Retirement literacy	Bequests	Professional advice	nformation sources	Financial literacy	Age	Male	Household income	Single
DC plan	1.00																							
Pension only	-0.08*	1.00																						
#Pension sources	0.30*	-0.54*	1.00																					
Partner's pension	0.18*	-0.28*	0.58*	1.00																				
Continue to work	0.09*	-0.21*	0.44*	0.18*	1.00																			
Pension & investments	0.29*	-0.44*	0.72*	0.38*	0.32*	1.00																		
Pension & liquid assets	0.27*	-0.41*	0.68*	0.35*	0.32*	0.92*	1.00																	
Pension & illiquid assets	0.18*	-0.24*	0.55*	0.30*	0.18*	0.54*	0.35*	1.00																
Household savings	0.10*	-0.21*	0.30*	0.17*	0.09*	0.27*	0.28*	0.14*	1.00															
Savings to income ratio	0.04	-0.17*	0.21*	0.05*	0.06	0.21*	0.21*	0.10*	0.64*	1.00														
Saving for old age	0.23*	-0.14*	0.48*	0.33*	0.17*	0.51*	0.50*	0.31*	0.25*	0.16*	1.00													
Stocks	0.13*	-0.16*	0.25*	0.11*	0.09*	0.25*	0.27*	0.11*	0.37*	0.21*	0.23*	1.00												
Downsizing	0.15*	-0.20*	0.48*	0.27*	0.14*	0.46*	0.28*	0.85*	0.11*	0.07*	0.29*	0.09*	1.00											
Real estate	0.13*	-0.14*	0.36*	0.17*	0.17*	0.31*	0.24*	0.58*	0.11*	0.07*	0.15*	0.11*	0.15*	1.00										
$Entrant_{Post\ auto\text{-}enrolment}$	-0.01	0.06*	-0.08*	-0.02	0.03	-0.03	-0.01	-0.04	-0.05*	-0.04	-0.14*	-0.06*	-0.04	0.01	1.00									
Retirement literacy	0.24*	-0.12*	0.24*	0.11*	0.10*	0.18*	0.17*	0.13*	0.21*	0.12*	0.16*	0.16*	0.10*	0.07*	-0.03	1.00								
Bequests	0.03	-0.03	0.00	0.05	-0.02	-0.06*	-0.06*	-0.01	0.02	-0.02	-0.05	0.01	-0.01	-0.02	-0.01	0.09*	1.00							
Professional advice	-0.02	-0.06*	-0.03	-0.03	0.01	-0.06*	-0.05*	-0.02	0.05*	0.00	-0.06*	0.06*	-0.02	0.01	0.07*	0.10*	0.24*	1.00						
Information sources	0.14*	-0.17*	0.37*	0.20*	0.18*	0.29*	0.28*	0.22*	0.24*	0.18*	0.28*	0.25*	0.18*	0.16*	0.04	0.18*	0.05	0.14*	1.00					
Financial literacy	0.20*	-0.16*	0.33*	0.16*	0.07*	0.27*	0.25*	0.15*	0.21*	0.14*	0.25*	0.16*	0.11*	0.12*	-0.14*	0.25*	-0.09*	-0.14*	0.21*	1.00				
Age	0.09*	-0.12*	0.20*	0.09*	-0.04	0.11*	0.07*	0.10*	0.15*	0.08*	0.24*	0.10*	0.11*	0.00	-0.63*	0.07*	-0.12*	-0.09*	-0.04	0.21*	1.00			
Male	0.06*	-0.02	0.03	-0.04	0.08*	0.02	0.03	-0.02	0.11*	0.07*	0.01	0.10*	-0.03	0.04	-0.03	0.15*	0.05	0.14*	0.03	0.07*	0.01	1.00		
Household income	0.19*	-0.10*	0.24*	0.23*	0.08*	0.18*	0.18*	0.11*	0.48*	-0.00	0.19*	0.23*	0.09*	0.07	0.02	0.23*	0.15*	0.09*	0.19*	0.19*	0.02	0.11*	1.00	
Single	-0.06*	0.13*	-0.14*	-0.15*	0.02	-0.05	-0.01	-0.07*	-0.14*	-0.03	-0.13*	-0.10*	-0.07*	-0.01	0.30*	-0.11*	-0.35*	-0.13*	-0.02	-0.03	-0.43*	-0.01	-0.21*	1.00

Appendix Table 3

Multinomial probit models: Pension-plan participation in the UK

This table presents marginal effects from two weighted multinomial probit models. Model A in columns A_1-A_3 is regarding any pension plan participation, distinguishing between 3 alternative outcomes: (1) Yes; (2) No; (3) I don't know. This model is an alternative to the binary model for the first-stage regressions shown in column 4 of Table 2. Model B in columns B_1-B_4 examines type-of-pension plan, distinguishing between 4 outcomes (1) DC plan; (2) DB plan; (3) A mix of DC and DB plans, and (4) No pension plan. This model is an alternative to the binary model for second-stage regressions shown in Table 3, excluding the correction for selection into any pension plan (inverse Mills ratio). All models include fixed effects for 12 administrative regions. Robust standard errors are reported in brackets. The asterisks denote the following levels of significance: ***: <0.01, **: <0.05, *: <0.1.

	(A) Pension plan participation			**(B) DC plan participation**			
	Yes	**No**	**Don't Know**	**DC**	**DB**	**DC & DB plan**	**No pension**
	(A_1)	(A_2)	(A_3)	(B_1)	(B_2)	(B_3)	(B_4)
IV1 : $Entrant_{Post\ auto\text{-}enrolment}$	0.111***	-0.101***	-0,010	0.081***	0,038	-0,023	-0.096***
	[0.028]	[0.027]	[0.016]	[0.029]	[0.028]	[0.018]	[0.027]
IV2: Retirement literacy	0.129***	-0.072***	-0.058***	0.083***	-0.023**	0.020***	-0.080***
	[0.012]	[0.012]	[0.009]	[0.012]	[0.011]	[0.007]	[0.012]
Age	0.007***	-0.009***	0.002***	0,001	0.005***	0.003***	-0.009***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Male	0.038*	-0.049**	0,011	-0,001	0,003	0.048***	-0.049***
	[0.019]	[0.019]	[0.011]	[0.020]	[0.019]	[0.012]	[0.019]
Present orientation	-0.013***	0.009**	0.004**	0,001	-0,006	-0,002	0.008**
	[0.004]	[0.004]	[0.002]	[0.004]	[0.004]	[0.002]	[0.004]
Education: Postgraduate	0.218***	-0.231***	0,013	0,057	0.113**	0.065**	-0.235***
	[0.044]	[0.044]	[0.026]	[0.047]	[0.047]	[0.027]	[0.044]
-"-: Undergraduate	0.205***	-0.226***	0,021	0.110**	0,056	0.060**	-0.225***
	[0.041]	[0.040]	[0.024]	[0.044]	[0.045]	[0.026]	[0.041]
-"-: Vocational	0.116***	-0.160***	0.044**	0.074*	0,048	0,039	-0.161***
	[0.039]	[0.038]	[0.022]	[0.043]	[0.043]	[0.025]	[0.039]
-"-: Secondary	0.108**	-0.140***	0,032	0,068	0,044	0,026	-0.138***
	[0.043]	[0.042]	[0.023]	[0.046]	[0.047]	[0.027]	[0.042]
-"-: Primary	0.086**	-0.117***	0,031	0.076*	0,033	0,009	-0.118***
	[0.039]	[0.038]	[0.021]	[0.043]	[0.042]	[0.026]	[0.038]
-"-: None/Incomplete	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
White	0,028	-0,039	0,011	-0,007	0,055	-0,008	-0,041
	[0.036]	[0.035]	[0.021]	[0.035]	[0.037]	[0.023]	[0.035]
Marital status: Married	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Single	-0,006	-0,017	0,024	0.050*	-0,031	-0,005	-0,014
	[0.025]	[0.025]	[0.015]	[0.025]	[0.024]	[0.014]	[0.025]
-"-: Widowed/Divorced	0,053	-0,048	-0,005	0,021	0,01	0,017	-0,048
	[0.035]	[0.036]	[0.017]	[0.035]	[0.032]	[0.018]	[0.036]
Number of children	0,008	-0,003	-0,005	-0,002	0,003	0,003	-0,004
	[0.011]	[0.011]	[0.006]	[0.011]	[0.011]	[0.006]	[0.011]
Log(household income)	-0.642***	0.597***	0,046	-1.250***	0,286	0.337**	0.627***
	[0.226]	[0.214]	[0.121]	[0.258]	[0.219]	[0.135]	[0.215]
$Log(household\ income)^2$	0.085***	-0.076**	-0,009	0.174***	-0,044	-0.050**	-0.080**
	[0.033]	[0.031]	[0.018]	[0.037]	[0.032]	[0.020]	[0.031]
$Log(household\ income)^3$	-0.003**	0.003**	0,001	-0.007***	0,002	0.002**	0.003**
	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.001]	[0.001]
Home ownership: Outright	0,04	-0,032	-0,008	-0.059**	0.100***	-0,011	-0,03
	[0.025]	[0.025]	[0.014]	[0.026]	[0.024]	[0.015]	[0.025]
-"-: Mortgage	0.098***	-0.110***	0,013	0.048**	0.038*	0,022	-0.107***
	[0.023]	[0.023]	[0.013]	[0.024]	[0.023]	[0.013]	[0.023]
-"-: None	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
Urbanity: Large city	-0,035	0,027	0,008	-0,038	0,007	0,007	0,024
	[0.022]	[0.022]	[0.013]	[0.023]	[0.022]	[0.014]	[0.022]

Appendix Table 3 continued in next page

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	(A1)	(A2)	(A3)	(B1)	(B2)	(B3)	(B4)
-"-: Small city/suburbs	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Village	-0,007	-0,004	0,011	0,001	0,013	-0,008	-0,005
	[0.031]	[0.031]	[0.016]	[0.031]	[0.029]	[0.018]	[0.031]
% IV_1 effect	*20.1%*	*-27.4%*	*-13.1%*	*27.0%*	*15.2%*	*-27.4%*	*-26.2%*
% IV_2 effect	*23.3%*	*-19.6%*	*-74.6%*	*27.7%*	*-9.2%%*	*24.4%*	*-21.8%*
Predicted probability	*0.554*	*0.368*	*0.078*	*0.2994*	*0.2507*	*0.0821*	*0.3678*
No. of observations	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*

Appendix Table 4

Third stage results from endogenous-treatment-effect models with correction for selection and bootstrapped standard errors: Retirement financing in the UK

This table presents estimates from weighted maximum-likelihood likelihood of the third stage of endogenous-treatment models regarding retirement-financing sources in the UK. It serves as an alternative to Table 5, ensuring robustness in the standard errors when incorporating predictions from previous stages. Hence, bootstrapped standard errors based on 1,000 replications are reported in brackets. To account for sample selection, all specifications incorporate the inverse Mills ratio calculated at the first stage of the model shown in column 4 of Table 2. The endogeneity of DC plan participation is accounted for in the second stage of the model shown in column 3 of Table 3. All 6 specifications incorporate fixed effects for the 12 administrative regions of the UK. The dependent variables in each column are the following: (1) A continuous variable for the logarithm of the amount in household savings; (2) A continuous variable for the savings to income ratio of the household; (3) A dummy variable for saving for old age; (4) A dummy variable for ownership of stocks; (5) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release; (6) A dummy variable for ownership of illiquid assets, other than own pension, namely buy-to-let or other income from a property which is not the primary residence. The asterisks denote the usual levels of significance.

	Log (Savings)	**Savings to income**	**Saving for old age**	**Stocks**	**Downsizing**	**Real estate**
	(1)	(2)	(3)	(4)	(5)	(6)
DC plan	3.041***	0.344***	0.290***	0.151***	0.074***	0.062***
	[0.393]	[0.017]	[0.044]	[0.033]	[0.018]	[0.016]
Inverse Mills ratio	0.083	-0.022***	0.016	-0.036***	-0.006	-0.012**
	[0.102]	[0.008]	[0.011]	[0.009]	[0.007]	[0.005]
Age	-0.005	0.001	0.006***	0.002***	0.001***	0.001
	[0.006]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Male	0.125	0.003	-0.006	0.038***	-0.013	0.006
	[0.113]	[0.009]	[0.013]	[0.011]	[0.008]	[0.006]
Present orientation	-0.237***	-0.013***	-0.021***	-0.013***	-0.001	-0.004***
	[0.024]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]
Education: Postgraduate	1.188***	0.058***	0.060**	0.033	0.019	0.02
	[0.269]	[0.021]	[0.028]	[0.023]	[0.017]	[0.013]
-"-: Undergraduate	1.142***	0.038*	0.138***	0.037*	0.034**	0.014
	[0.263]	[0.020]	[0.026]	[0.019]	[0.015]	[0.011]
-"-: Vocational	0.667***	0.001	0.082***	0.006	0.019	-0.002
	[0.246]	[0.019]	[0.025]	[0.018]	[0.014]	[0.009]
-"-: Secondary	0.911***	0.026	0.089***	0.01	0.022	0.003
	[0.248]	[0.019]	[0.025]	[0.018]	[0.014]	[0.009]
-"-: Primary	0.523**	0.011	0.036	-0.030*	-0.017	-0.002
	[0.242]	[0.018]	[0.022]	[0.016]	[0.012]	[0.008]
-"-: None/Incomplete	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
White	0.141	0.033*	0.006	-0.059***	0.021	-0.035**
	[0.206]	[0.017]	[0.022]	[0.021]	[0.013]	[0.015]
Marital status: Single	-0.197	-0.01	-0.004	0.02	0.01	0.007
	[0.150]	[0.012]	[0.016]	[0.013]	[0.010]	[0.008]
-"-: Married	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Widowed/Divorced	-0.350	-0.031*	-0.017	0.018	0.009	0.001
	[0.219]	[0.018]	[0.024]	[0.018]	[0.016]	[0.010]
Number of children	-0.082	-0.004	-0.033***	-0.006	-0.002	-0.006*
	[0.066]	[0.005]	[0.007]	[0.005]	[0.005]	[0.003]
Log(household income)	8.441***	0.505***	0.553***	0.597***	0.054	0.110*
	[1.218]	[0.106]	[0.130]	[0.111]	[0.082]	[0.066]
Log(household income)^2	-1.167***	-0.069***	-0.087***	-0.093***	-0.008	-0.018*
	[0.177]	[0.015]	[0.019]	[0.016]	[0.012]	[0.010]
Log(household income)^3	0.052***	0.003***	0.004***	0.004***	0.001	0.001**
	[0.008]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]

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	(1)	(2)	(3)	(4)	(5)	(6)
Home ownership: Outright	1.717***	0.146***	0.100***	0.117***	0.063***	0.014*
	[0.165]	[0.013]	[0.018]	[0.016]	[0.011]	[0.008]
-"-: Mortgage	0.618***	0.019	0.061***	0.001	0.108***	0.025***
	[0.150]	[0.012]	[0.017]	[0.011]	[0.011]	[0.008]
-"-: None	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
Urbanity: Large city	0.469***	0.030***	-0.008	-0.022**	0.004	-0.001
	[0.137]	[0.011]	[0.015]	[0.011]	[0.009]	[0.007]
-"-: Small city/suburbs	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Village	0.139	0.011	0.028	0.004	0.002	0.016
	[0.181]	[0.015]	[0.021]	[0.016]	[0.013]	[0.010]
DC-plan effect	*£2,092.6*	*182.4%*	*121.6%*	*122.5%*	*102.9%*	*154.4%*
Linear prediction	*5.8711*	*0.1885*	*0.2389*	*0.1232*	*0.0723*	*0.0402*
No. of observations	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*

Appendix Table 5

Third stage results from endogenous-treatment-effect models without correction for selection: Retirement financing in the UK among pension plan participants only

This table presents estimates from weighted maximum-likelihood likelihood of the third stage of endogenous-treatment models regarding retirement-financing sources in the UK. Robust standard errors are shown in brackets. It serves as an alternative to the estimates of Table 5, presenting estimates for the sub-sample that excludes individuals without any pension plan. Hence, the models do not account for selection, i.e., the omit the first stage of the estimation methodology and exclude the inverse Mills ratio from the two remaining stages. All 6 specifications incorporate fixed effects for the 12 administrative regions of the UK. The dependent variables in each column are the following: (1) A continuous variable for the logarithm of the amount in household savings; (2) A continuous variable for the savings to income ratio of the household; (3) A dummy variable for saving for old age; (4) A dummy variable for ownership of stocks; (5) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release; (6) A dummy variable for ownership of illiquid assets, other than own pension, namely buy-to-let or other income from a property which is not the primary residence. The asterisks denote the usual levels of significance.

	Log (Savings)	**Savings to income**	**Saving for old age**	**Stocks**	**Downsizing**	**Real estate**
	(1)	(2)	(3)	(4)	(5)	(6)
DC plan	4.366***	0.194***	0.244**	0.216***	0.091	0.095***
	[0.397]	[0.063]	[0.102]	[0.068]	[0.085]	[0.036]
Age	0.005	0.002**	0.010***	0.003***	0.003**	0.001
	[0.011]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Male	-0.103	-0.004	-0.069***	0.036*	-0.046**	0.007
	[0.216]	[0.015]	[0.026]	[0.021]	[0.021]	[0.014]
Present orientation	-0.247***	-0.015***	-0.036***	-0.020***	-0.001	-0.006**
	[0.045]	[0.003]	[0.005]	[0.004]	[0.004]	[0.003]
Education: Postgraduate	0.701	0.061	0.093	0.05	-0.016	0.076***
	[0.612]	[0.047]	[0.060]	[0.051]	[0.052]	[0.026]
-"-: Undergraduate	0.068	0.003	0.183***	0.047	0.014	0.057**
	[0.608]	[0.047]	[0.057]	[0.048]	[0.051]	[0.022]
-"-: Vocational	-0.502	-0.044	0.171***	0.038	-0.025	0.026
	[0.597]	[0.046]	[0.056]	[0.048]	[0.047]	[0.017]
-"-: Secondary	-0.204	-0.036	0.098*	0.017	0.007	0.037*
	[0.619]	[0.046]	[0.059]	[0.051]	[0.052]	[0.020]
-"-: Primary	-0.106	-0.008	0.122**	-0.045	-0.092**	0.060***
	[0.604]	[0.047]	[0.055]	[0.043]	[0.045]	[0.022]
-"-: None/Incomplete	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
White	0.265	0.030	0.067*	-0.133***	0.048*	-0.099***
	[0.382]	[0.025]	[0.041]	[0.047]	[0.028]	[0.038]
Marital status: Single	-0.208	0.005	0.001	-0.006	0.031	0.011
	[0.270]	[0.018]	[0.032]	[0.025]	[0.027]	[0.016]
-"-: Married	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Widowed/Divorced	-0.175	-0.002	0.009	0.015	0.031	0.004
	[0.391]	[0.027]	[0.045]	[0.036]	[0.036]	[0.022]
Number of children	-0.128	-0.011	-0.031**	-0.009	0.005	-0.004
	[0.127]	[0.008]	[0.015]	[0.011]	[0.013]	[0.007]
Log(household income)	6.930**	0.380*	0.689**	0.833***	0.13	0.006
	[2.842]	[0.200]	[0.338]	[0.248]	[0.225]	[0.176]
Log(household income)^2	-0.928**	-0.052*	-0.110**	-0.128***	-0.019	-0.006
	[0.407]	[0.028]	[0.049]	[0.036]	[0.033]	[0.026]
Log(household income)^3	0.041**	0.002*	0.005**	0.006***	0.001	0.001
	[0.018]	[0.001]	[0.002]	[0.002]	[0.001]	[0.001]
Home ownership: Outright	2.279***	0.176***	0.128***	0.126***	0.100***	0.037**
	[0.304]	[0.022]	[0.036]	[0.030]	[0.025]	[0.016]
-"-: Mortgage	0.730***	0.045**	0.095***	0.004	0.169***	0.046***
	[0.283]	[0.020]	[0.030]	[0.022]	[0.023]	[0.015]

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	(1)	(2)	(3)	(4)	(5)	(6)
-"-: None	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
Labour status: Employee	-0.025	0.028	0.017	-0.054	0.02	-0.095
	[0.558]	[0.035]	[0.058]	[0.055]	[0.040]	[0.060]
"-": Self-employed	0.659	0.06	-0.092	0.008	-0.03	-0.098
	[0.658]	[0.044]	[0.072]	[0.070]	[0.053]	[0.065]
	[0.887]	[0.054]	[0.077]	[0.058]	[0.050]	[0.057]
"-": Homemaker	-0.751	-0.009	-0.142*	-0.093	0.026	-0.098
	[0.750]	[0.051]	[0.079]	[0.068]	[0.066]	[0.069]
"-": Student	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
Urbanity: Large city	0.321	0.012	-0.013	-0.028	0.005	-0.012
	[0.256]	[0.017]	[0.031]	[0.024]	[0.025]	[0.017]
-"-: Small city/suburbs	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Village	-0.051	0.006	0.034	0.011	0.044	-0.006
	[0.341]	[0.023]	[0.041]	[0.032]	[0.034]	[0.020]
DC-plan effect	*£7,872.8*	*90.0%*	*69.6%*	*132.3%*	*66.2%*	*149.1%*
Predicted probability	*6.7788*	*0.2152*	*0.3502*	*0.1634*	*0.137*	*0.0634*
No. of Observations	*2,554*	*2,554*	*2,554*	*2,554*	*2,554*	*2,554*

Appendix Table 6

Third stage results from linear instrumental-variable (IV) models with correction for selection: Retirement financing in the UK

This table presents estimates from weighted IV regressions of the third stage of the models regarding retirement-financing sources in the UK. To account for sample selection, all specifications incorporate the inverse Mills ratio calculated at the first stage of the model shown in column 4 of Table 2. Robust standard errors are shown in brackets. The table serves as an alternative to the ML endogenous-treatment-effect models presented in Table 5. In essence its endogenous DC plan variable is not estimated via a binary choice model. It also serves as a conceptual link to the IV models used for the causal mediation analysis in Table 6. All six specifications incorporate fixed effects for the 12 administrative regions of the UK. The dependent variables in each column are the following: (1) A continuous variable for the logarithm of the amount in household savings; (2) A continuous variable for the savings to income ratio of the household; (3) A dummy variable for saving for old age; (4) A dummy variable for ownership of stocks; (5) A dummy variable for ownership of illiquid assets, other than own pension, namely real estate for downsizing/equity release; (6) A dummy variable for ownership of illiquid assets, other than own pension, namely buy-to-let or other income from a property which is not the primary residence. The asterisks denote the usual levels of significance.

	Log (Savings)	**Savings to income**	**Saving for old age**	**Stocks**	**Downsizing**	**Real estate**
	(1)	(2)	(3)	(4)	(5)	(6)
DC plan	3.627***	0.194***	0.389***	0.198**	0.170**	0.086*
	[0.771]	[0.056]	[0.094]	[0.078]	[0.071]	[0.048]
Inverse Mills ratio	-0.045	-0.011	0.02	-0.027*	-0.005	-0.015*
	[0.156]	[0.011]	[0.018]	[0.014]	[0.012]	[0.009]
Age	-0.012	0.001*	0.006***	0.002**	0.001**	0.001
	[0.009]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Male	0.073	0.008	-0.03	0.030*	-0.032**	0.008
	[0.163]	[0.012]	[0.019]	[0.016]	[0.014]	[0.010]
Present orientation	-0.218***	-0.014***	-0.025***	-0.013***	-0.002	-0.005***
	[0.032]	[0.002]	[0.004]	[0.003]	[0.003]	[0.002]
Education: Postgraduate	1.153***	0.065**	0.038	0.04	-0.008	0.021
	[0.390]	[0.028]	[0.038]	[0.032]	[0.029]	[0.019]
-"-: Undergraduate	0.829**	0.032	0.096***	0.022	0.017	0.01
	[0.399]	[0.029]	[0.037]	[0.031]	[0.031]	[0.018]
-"-: Vocational	0.377	-0.011	0.090***	0.016	-0.009	-0.009
	[0.353]	[0.026]	[0.031]	[0.027]	[0.024]	[0.013]
-"-: Secondary	0.722*	0.014	0.071**	0.016	0.022	-0.005
	[0.374]	[0.026]	[0.034]	[0.029]	[0.027]	[0.014]
-"-: Primary	0.648*	0.014	0.047	-0.041*	-0.048**	0.012
	[0.349]	[0.026]	[0.029]	[0.022]	[0.022]	[0.014]
-"-: None/Incomplete	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
White	0.010	0.032*	0.058**	-0.079***	0.040**	-0.055**
	[0.257]	[0.018]	[0.027]	[0.029]	[0.016]	[0.022]
Marital status: Single	-0.012	0.014	-0.002	-0.002	0.016	0.005
	[0.209]	[0.015]	[0.023]	[0.019]	[0.018]	[0.011]
-"-: Married	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Widowed/Divorced	-0.092	-0.011	-0.002	0.007	0.018	-0.004
	[0.314]	[0.022]	[0.035]	[0.026]	[0.028]	[0.016]
Number of children	-0.046	-0.003	-0.031***	-0.004	0.002	-0.005
	[0.095]	[0.007]	[0.010]	[0.008]	[0.008]	[0.005]
Log(household income)	9.038***	0.470***	0.665***	0.549***	0.147	0.133
	[1.741]	[0.125]	[0.200]	[0.155]	[0.132]	[0.110]
Log(household income)^2	-1.237***	-0.065***	-0.103***	-0.086***	-0.021	-0.022
	[0.252]	[0.018]	[0.029]	[0.023]	[0.020]	[0.016]
Log(household income)^3	0.054***	0.003***	0.005***	0.004***	0.001	0.001
	[0.011]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]

Appendix Table 6 continued in next page

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	(1)	(2)	(3)	(4)	(5)	(5)
Home ownership: Outright	2.095***	0.159***	0.091***	0.114***	0.061***	0.014
	[0.219]	[0.016]	[0.024]	[0.022]	[0.016]	[0.011]
-"-: Mortgage	0.734***	0.037**	0.058**	-0.014	0.112***	0.024**
	[0.214]	[0.015]	[0.023]	[0.017]	[0.017]	[0.011]
-"-: None	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
Urbanity: Large city	0.444**	0.026*	-0.018	-0.009	0.003	-0.008
	[0.192]	[0.014]	[0.022]	[0.017]	[0.016]	[0.011]
-"-: Small city/suburbs	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Village	0.212	0.016	0.021	0.013	0.029	-0.002
	[0.259]	[0.018]	[0.031]	[0.024]	[0.025]	[0.015]
DC-plan effect	*£3,760.0*	*100.4%*	*161.1%*	*156.0%*	*186.3%*	*194.4%*
Linear prediction	*6.1135*	*0.193*	*0.2413*	*0.1266*	*0.0914*	*0.0444*
No. of observations	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*

Appendix Table 7

Instrument-validity tests

This table shows three sets of instrument validity tests for under identification, weak identification and over-identification corresponding to the regressions in the *Appendix Table 6*. The F-test represents the F-test of excluded instruments. The null hypothesis in that case presumes that the excluded instruments have no explanatory power over the outcome variable and should be excluded from the model. The rejection of the null hypothesis is the appropriate outcome. The statistical significance in the Kleibergen-Paap LM statistics is interpreted as a the rejection of the null hypothesis of weak identification. For the test for weak identification, the Kleibergen-Paap LM test should be compared to the Stock-Yogo weak ID critical value and – when greater in value – it suggests the rejection of the hypothesis of weak identification. Finally, the lack of statistical significance in the Hansen J statistic for over-identification shows the rejection of the hypothesis of over-identification. When each instrument is used separately, the Hansen J statistics is zero as the equation is exactly identified. The asterisks denote the following levels of significance: ***: <0.01, **: <0.05, *: <0.1.

	Log (Savings)	**Savings to income**	**Saving for old age**	**Stocks**	**Downsizing**	**Real estate**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Both instruments						
F-test	46.69***	46.69***	46.69***	46.69***	46.69***	46.69***
Under-identification test (Kleibergen-Paap LM statistic)	86.700***	86.700***	86.700***	86.700***	86.700***	86.700***
Weak identification test (Cragg-Donald Wald F statistic)	98.621	98.621	98.621	98.621	98.621	98.621
Stock-Yogo weak ID test critical values	19.930	19.930	19.930	19.930	19.930	19.930
Hansen J statistic	0.095	0.203	2.414	2.656	1.333	0.366
Panel B: Entrant post auto-enrolment						
Under-identification test (Kleibergen-Paap LM statistic)	8.558***	8.558***	8.558***	8.558***	8.558***	8.558***
Weak identification test (Cragg-Donald Wald F statistic)	15.360	15.360	15.360	15.360	15.360	15.360
Stock-Yogo weak ID test critical values	16.38	16.38	16.38	16.38	16.38	16.38
Hansen J statistic	–	–	–	–	–	–
Panel C: Retirement literacy						
Under-identification test (Kleibergen-Paap LM statistic)	87.535***	87.535***	87.535***	87.535***	87.535***	87.535***
Weak identification test (Cragg-Donald Wald F statistic)	182.779	182.779	182.779	182.779	182.779	182.779
Stock-Yogo weak ID test critical values	16.38	16.38	16.38	16.38	16.38	16.38
Hansen J statistic	–	–	–	–	–	–

Appendix Table 8

Second stage causal-mediation-analysis results from linear instrumental-variable (IV) models with correction for selection: The effect of DC plans on candidate mediators

This table presents estimates from weighted IV regressions of the second stage of the causal mediation analysis, which estimates the effect of the instrumented endogenous variable on the candidate mediator. To account for sample selection, all specifications incorporate the inverse Mills ratio calculated at the first stage of the model shown in column 4 of Table 2. Robust standard errors are shown in brackets. All six specifications incorporate fixed effects for the 12 administrative regions of the UK. The dependent variables in each column are the following: (1) A dummy variable for bequest motives (#children>0) (2) The logarithm of household income; (3) A continuous variable for present orientation, ranging between 0 and 10; (4) A dummy variable for professional advice on money matters; (5) A continuous variable for the number of information sources on money matters, ranging between 0 and 8; (6) A continuous variable for the number of correct responses in 3 financial-literacy questions. The asterisks denote the usual levels of significance.

	Bequest motives	**Log (Household income)**	**Present bias**	**Professional advice**	**#Information sources**	**Financial literacy**
	(1)	(2)	(3)	(4)	(5)	(6)
DC plan	0.164*	1.447***	-1.351***	0.240**	1.680***	1.679***
	[0.096]	[0.467]	[0.507]	[0.095]	[0.395]	[0.260]
Inverse Mills ratio	0.046**	-0.527***	0.185*	0.019	-0.094	-0.303***
	[0.018]	[0.100]	[0.102]	[0.018]	[0.076]	[0.051]
Age	-0.014***	-0.015***	0.020***	-0.004***	-0.005	0.015***
	[0.001]	[0.005]	[0.006]	[0.001]	[0.004]	[0.003]
Male	0.017	0.050	-0.091	0.067***	-0.085	0.068
	[0.020]	[0.110]	[0.110]	[0.019]	[0.081]	[0.056]
Education: Postgraduate	-0.027	0.936***	-1.284***	0.127***	0.870***	0.386***
	[0.049]	[0.284]	[0.267]	[0.047]	[0.169]	[0.128]
-"-: Undergraduate	-0.114**	0.749***	-1.079***	-0.082*	0.800***	0.493***
	[0.048]	[0.274]	[0.271]	[0.045]	[0.165]	[0.128]
-"-: Vocational	-0.074*	0.492*	-0.718***	-0.005	0.639***	0.377***
	[0.044]	[0.260]	[0.250]	[0.041]	[0.139]	[0.110]
-"-: Secondary	-0.155***	0.996***	-0.913***	-0.057	0.697***	0.355***
	[0.046]	[0.247]	[0.259]	[0.043]	[0.152]	[0.122]
-"-: Primary	-0.051	0.410	-0.551**	-0.082**	0.124	0.223**
	[0.043]	[0.255]	[0.250]	[0.038]	[0.124]	[0.109]
-"-: None/Incomplete	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
White	-0.058*	0.495***	0.403**	-0.026	0.126	0.106
	[0.032]	[0.185]	[0.190]	[0.036]	[0.132]	[0.098]
Marital status: Single	-0.474***	-0.227*	0.473***	-0.108***	0.041	0.144**
	[0.024]	[0.120]	[0.143]	[0.027]	[0.100]	[0.072]
-"-: Married	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Widowed/Divorced	-0.101***	-0.661***	-0.048	0.023	0.014	-0.110
	[0.034]	[0.219]	[0.204]	[0.036]	[0.147]	[0.097]
Number of children	–	0.061	-0.045	0.058***	0.038	-0.059**
		[0.061]	[0.059]	[0.011]	[0.041]	[0.029]
Log(household income)	0.173	–	-0.218	0.798***	1.855**	1.794***
	[0.209]		[1.219]	[0.225]	[0.822]	[0.585]
Log(household income)^2	-0.023	–	0.049	-0.104***	-0.258**	-0.265***
	[0.030]		[0.176]	[0.033]	[0.120]	[0.085]
Log(household income)^3	0.001	–	-0.003	0.004***	0.011**	0.012***
	[0.001]		[0.008]	[0.001]	[0.005]	[0.004]
Present bias	-0.002	0.018	–	-0.004	-0.077***	0.009
	[0.004]	[0.023]		[0.004]	[0.017]	[0.011]
Home ownership: Outright	0.070***	0.531***	-1.339***	0.175***	0.385***	0.043
	[0.027]	[0.135]	[0.145]	[0.027]	[0.104]	[0.074]
-"-: Mortgage	0.117***	0.293**	-0.402***	0.041	0.062	-0.128*
	[0.026]	[0.137]	[0.138]	[0.025]	[0.103]	[0.070]

Appendix Table A8 continues in next page

Appendix Table A8 continues from last page

	(1)	(2)	(3)	(4)	(5)	(6)
-"-: None	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
Urbanity: Large city	0.001	0.581***	-0.309**	0.026	0.021	-0.069
	[0.024]	[0.128]	[0.127]	[0.023]	[0.089]	[0.064]
-"-: Small city/suburbs	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}	{*Ref.*}
-"-: Village	-0.063**	0.360**	0.072	-0.030	-0.066	0.042
	[0.031]	[0.180]	[0.170]	[0.030]	[0.120]	[0.087]
DC plan effect	*39.9%*	*£425.0*	*-38.4%*	*95.0%*	*0.8920*	*111.9%*
Predicted probability	*0.4104*	*9.1851*	*3.5155*	*0.2522*	*1.8829*	*1.5008*
No. of observations	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*	*4,082*