# Economic essays in informal care.

# Discovery, Policy and Impact

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# Thesis Abstract

This thesis comprises three distinct chapters covering informal care. The first chapter provides an overview of the current economic literature surrounding informal/unpaid carers, the current understanding of the informal care sector, and a concise explanation of the current social care landscape in the UK. The findings of this analysis have motivated the subjects of the proceeding chapters. The second chapter provides an evaluation of the "Care Act 2014" by using a Difference-in-Differences framework, with analysis on the act and additionally how it interacts with employment status and income. Evidence suggesting that carer uptake (becoming an informal carer) in the presence of the act increased between 0.9 and 2.3 % whilst carer retention (continuing to provide informal care) increased between 4.2 to 8.2 %. These estimates were statistically significant. The third chapter analyses the impact, being a carer in middle adolescence has on economic activity at aged 20 & 25 with additional analysis on employment participation and earnings at aged 25. Using Propensity Score Matching to address the selection bias present between carers and non-carers, findings suggest adolescent carers: i) were between 2.9 and 14.9 % more likely to have never gained employment by their mid-20's relative to non-carers; ii) between 4 and 17.6 % less likely to be employed at the age of 25; and iii) between 3.8 and 14.3 % less likely to be economically active at the age of 25. These results suggest that barriers to employment have been significant for these carers and there may be long term effects long after the care has ended, impacting these individuals.

This thesis provides a comprehensive analysis of informal carers from multiple perspectives, highlighting both the legislative context and the long-term economic impacts of caregiving. This research offers valuable insights for policy and support frameworks aimed at mitigating these effects.

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"Thank you for your efforts, dedication and guidance on this journey"

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It is the result of my own work and in accordance with all considerations as expected in academia. All output and results have been performed correctly and genuinely to the best of my knowledge. All citations have also been included as accurately as possible, with the best intentions and to provide full attribution to the respective authors.

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The CLS cohorts are only possible due to the commitment and enthusiasm of their participants, their time and contribution is gratefully acknowledged."

All data has been used in conjunction with ethical processes demanded by the data repositories at the UK Data Service and CLS, kept securely and destroyed upon acceptance of thesis.

"I would like to thank all those who decided to take part in these surveys. Without you this research would not have been possible."

Brock Cox

# Personal Acknowledgements

I dedicate this self-funded thesis to the underdogs of the world—those who were told they'd never amount to anything, those facing a tougher road than most, who get knocked down but rise again every single day, despite the adversities. To those who take the hits, endure the setbacks, and continue the fight, where quitting isn't an option and giving up is never possible. To those for whom every step forward feels like a challenge and an unknown, where the only easy day was yesterday. To those who are overlooked by those in power, dismissed by teachers, and pushed to the edge when the world feels heavy and dark. To those who get knocked back. Keep up the fight.

Get up off your Harris, shake off the doubt, and have a word with yourself. Keep pushing forward, step by step. The world is there for the taking—conquer the challenges and exceed all expectations. Let the doubters eat their words. Seize every moment, because time doesn't wait for anyone. Make no excuses and enjoy the journey. Remember to be kind and walk lightly. Believe in yourself.

Remember:

"He who dares, wins."

Del Boy, Only fools and horses.

The unwavering belief, support and love of so many people throughout my life have enabled me to shed light on the daily struggles of unpaid carers—those who can't walk away, whose love pulls them out of bed day after day, who have sacrificed their own careers or dreams to offer the purest form of human emotion: love. These are the ones whose loved ones no longer recognise them, remember their name, or even recall the day they were married. The ones whose love is taken for granted, always there but not thanked for. The darkest days feel unrelenting. Yet, in the midst of the pain, where loneliness and isolation become all too familiar, love is the only light that shines through,

> To the many unsung heroes providing care with love. Without you this would not have been possible, Thankyou

# Thesis Introduction

Informal or unpaid care is the largest provider of social care in the UK, and this is common across the world. Society's demand for social care is growing due to an ageing society; a society that now survives many previously fatal and life limiting conditions due to medical, scientific and public health advancements, faces the consequences of reduced independence and ongoing care. Whilst the dynamics in society are moving away from the nuclear and extended family unit. Gender equality in the workplace and more geographically dispersed families are reducing traditional informal carers. At the same time, the alternative, formal care, is publicly funded and expensive, with considerable difficulties in staffing and retention.

However, providing unpaid care is not free from consequences, as the published work has shown. The majority of the informal care published academic research comes from the fields of medicine and public health. This focuses on the reasons why informal care is necessary, its impact on the health of those receiving it and those providing it. It also alludes to the interconnection between primary and social care systems. However, a substantial body of literature has emerged examining the economics of informal caregiving. The long-term economic ramifications for caregivers include diminished retirement savings, heightened financial stress, premature labour market exits, reduced incomes, lower working hours and disrupted career trajectories.

Moreover, studies underscore the broader macroeconomic implications of informal care, particularly its impact on labour market productivity and the economic value it provides by reducing demand for formal care services. This has prompted growing calls for the implementation of policy measures aimed at alleviating financial strain on caregivers—such as tax relief, direct compensation, or pension credits—in recognition of their essential role in health and social care systems.

With an estimated 7.3 million unpaid carers in England alone according to National Audit Office (2021), there is increasing urgency for comprehensive policy interventions to address the socio-economic harms associated with informal care provision. Governments worldwide have expressed a commitment to supporting this vital cohort, acknowledging not only the economic efficiency of informal care but also its role in maintaining community-based care, strengthening familial bonds, and enhancing outcomes for individuals with lower levels of care needs. Despite its challenges, informal caregiving presents notable societal benefits and remains a cornerstone of many health and social care systems.

Chapter 1 provides an overview of the economic related literature focused on informal carers but also identifies gaps in the literature. One of these gaps is addressed in chapter 2 using the Understanding society longitudinal dataset. I evaluate a piece of legislation introduced in 2015, the English Care Act 2014. I accomplish this by adopting a Differencein-Differences (DID) framework to determine the impact on carer uptake and retention, using Scotland as the control group, whose own equivalent policy was not introduced until 2018. The policy was enacted to address a significant portion of the harms and difficulties faced by informal carers. The results of this chapter suggest that the act increased carer uptake between 0.9 and 2.3 % and carer retention increased between 4.2 and 8.2 %. The act appears to increase uptake in those under 50 and retention in those over 50 years old. Policy makers need to ensure the act is promoted effectively. Clear and quick identification of informal carers is vital to ensure local authorities and public institutions are aware, can provide support and ensure carers receive information that supports their efforts and sustains their health. Financial pressures are going to be a key factor in an individual's willingness to provide care and this will require further support in policies and procedures. Further attention needs to address the incompatibility of the labour market, in particular its legislation for informal carers. This may require financial interventions like those in Germany with their long term privately financed care insurance or how Germany adopts carer friendly labour market legislation and policies. Currently the published work that addresses young carers combines individuals between the ages of 16 and 29, see chapter 1. This fails to account for the varying impacts of caregiving at different stages of adolescence and early adulthood. I address this by analysing the impact for young people who provide such informal care, specifically those 16 and under, in chapter 3. Particularly, using data from the next steps longitudinal study and a propensity score matching method that attempts to alleviate potential selection bias, I look at how middle adolescent caring impacts economic activity, the barriers to employment and earnings at age 20 and 25. The chapter highlights there are distinct characteristic differences between carers and non-carers, particularly as the number of caring periods increases from 1 to 3 including and during 14 and 16 years old. I find that young carers: i) were between 2.9 and 14.9 % more likely to have never gained

employment by their mid-20's relative to those who did not provide such care; ii) between 4 and 17.6 % less likely to be employed at the age of 25; and iii) between 3.8 and 14.3 % less likely to be economically active at the age of 25. This showed that barriers to employment have been significant for these carers and that there may be long term effects long after the care has ended impacting these individuals.

Taken as a whole, rather than solely this thesis and its contents advance the broader understanding of the economic consequences of providing informal care. Particularly as the situation is discovered in chapter 1, policy is evaluated in chapter 2 and the impact of providing care in middle adolescence is analysed in chapter 3. Chapter 4 concludes this thesis but also alludes to future directions where research could further compliment the understanding.

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# 1 Chapter One: The current economic understanding of informal care.

### 1.1 Abstract

This chapter explores the economic impact of informal caregiving, emphasising the multifaceted considerations required to fully understand the experiences of informal carers. It begins with an overview of informal care and carers in the United Kingdom (UK), addressing the growing demand for social care, the limitations of the formal care sector, and how societal changes have positioned informal care as the largest provider of care. Comparisons with international contexts are also made.

The chapter further examines the willingness of individuals to provide informal care, its effects on labour market participation and earnings, and the health consequences for both caregivers and care recipients. Additionally, it reviews the literature on the suitability of informal care and the potential benefits of greater integration with formal health and care systems.

A brief discussion on the overall costs of informal care is provided, along with international comparisons. The chapter also considers relevant policies enacted to support informal carers. This review sets the foundation for the second paper in this thesis.

The final section addresses the complex nature of the existing literature on young carers, highlighting the need for a clearer definition and added focus given the different avenues and the potential long-term effects from providing care in these formative periods. This discussion also serves as the basis for the third paper in this thesis.

### 1.2 Introduction

The literature in the economics of informal care is a broad and rapidly growing field of research that explores all aspects and consequences of informal caregiving. This is evident in the wide range of publications in the field. On a macroeconomic level, the focus is often on the overall cost of providing formal care and the economic implications of informal care. Whether informal care is deemed a saving to society or a loss to the economy in productivity depends on one's interpretation of its value as an economic output. On one hand, informal care can be seen as a saving to society. This perspective emphasises the social benefits and cost reductions associated with caregiving. Informal caregivers, typically family members, perform tasks that would otherwise be assigned to formal care providers, such as paid home health aides or medical professionals in institutional settings. By providing this care at no cost to the recipient, informal caregivers help reduce the financial burden on healthcare systems and public services. This reduction in demand for formal care infrastructure, including the hiring of paid workers and the construction of care facilities, is often regarded as a societal saving. Moreover, the social value of informal care is not confined to financial considerations. The act of caregiving can strengthen familial ties, promote community solidarity, and ensure the well-being of individuals in a manner that extends beyond purely economic outputs.

Conversely, informal care is also viewed as a loss to the economy in terms of productivity. This viewpoint considers the opportunity costs associated with caregiving, particularly the potential loss of labour market participation. When individuals, typically working-age family members, take on caregiving roles, they often reduce their involvement in paid employment. This diversion of time and energy from the formal labour market represents a significant economic cost. Caregivers may experience lower income levels, reduced career advancement opportunities, or even complete withdrawal from the workforce, thereby diminishing overall economic productivity. In this sense, informal caregiving is seen not as an economic output but as an unaccounted-for loss in the labour market. The time spent on caregiving could otherwise be used for paid work, business activities, or educational pursuits, all of which contribute to the economy. However, this cost is not always directly captured by traditional economic measures, such as GDP (Gross Domestic Product).

The divergence in views regarding the economic value of informal care is rooted in the different interpretations of what constitutes valuable economic output. Economists and policymakers who prioritise market-based transactions and tangible outputs tend to regard informal care as a loss to productivity due to the labour diverted from the economy. From this perspective, the caregiving labour, while essential, does not contribute to measurable economic growth. In contrast, those who advocate for a more comprehensive approach to economic well-being argue that informal caregiving plays a crucial role in maintaining the social fabric and promoting community health, even if its value is not reflected in traditional economic metrics. These perspectives consider the broader implications of caregiving, recognising that informal care contributes to social cohesion, public health outcomes, and the stability of families, all of which have long-term societal benefits.

Ultimately, the economic impact of informal care cannot be fully understood without considering both its direct and indirect effects on the economy. While traditional economic models may focus on the immediate costs of labour market participation, a more inclusive approach is necessary to appreciate the full range of contributions that informal caregiving makes to society. By acknowledging the social and well-being benefits that caregiving provides, policymakers can begin to develop more nuanced frameworks that recognise the value of non-market labour. The growing recognition of the importance of social capital and well-being in economic discourse highlights the need to reassess how informal caregiving is valued, both in terms of its economic output and its role in supporting the broader social structure.

The literature covers specific aspects of informal care, examining the costs borne by caregivers, including lost earnings, adverse effects on their health, and reduced workforce participation. It also explores the suitability of informal care, the trade-offs between informal and formal care services, the motivations behind providing informal care, and the policies implemented to address social care needs.

This chapter, along with those in chapter 2 and 3, fits firmly within the economics of informal care, as well as the broader health economics literature. This literature review chapter begins by providing some background information on informal care mainly in the UK, quantifying informal carers and potential future developments. This chapter provides a standalone contextual overview as well as a springboard to the subsequent empirical-

based chapters. This chapter is set out as follows: 1.3 discusses the general situation present in the formal and informal care sector. 1.4 provides an overview of the currently published papers focused on providing informal care. 1.5 focuses on young carers with a conclusion in 1.6

### 1.3 Context

This section will broadly define unpaid/informal carers, how the demand for social care is growing as people live longer, challenges facing formal care and the role of informal carers.

### 1.3.1 Informal (unpaid) carers

Informal carers, also known as unpaid carers, have been the primary providers of care throughout history—long before the establishment of the welfare state or organised religious support systems. Unpaid informal care refers to the support provided by family members, friends, or neighbours to individuals with chronic illnesses, disabilities, or other health-related needs. This care, typically offered without financial compensation, spans a wide range of activities, including assistance with daily living tasks, medication management, emotional support, and ensuring the individual's safety and well-being.

Despite its critical role in maintaining the health and quality of life, informal caregiving has generally been until recently overlooked in discussions of healthcare systems. The impact of this care is far-reaching, benefiting not only the individuals receiving support but also the broader healthcare system by reducing demand on formal services. However, caregivers themselves frequently encounter significant emotional, physical, and financial challenges. Even so, unpaid informal care remains an indispensable element of care provision, ensuring the sustainability of healthcare systems worldwide. National Audit Office (2021) estimates there are approximately 7.3 million unpaid carers in England, significantly more than the circa 1.5 million formal care workers in social care, or the nearly 2 million people working in the NHS.

Informal care is increasingly being acknowledged in both legislation and national debates. Informal carers in England had to wait until the Care act 2014 to gain a legal right to be included in decisions affecting them and the care they provide. For many informal carers, choosing to provide care is a step into the unknown. Motivated by love and a deep connection with those in need, they often take on this responsibility without knowing when it will end, frequently without adequate support, and usually with little or no prior experience.

#### 1.3.2 Rising demand for care

The demand for social care is rising due to longer life expectancies, unhealthy lifestyle choices and the increased survivability of various diseases and disabilities. For example, in England and Wales life expectancy was around 40 years old in 1850 but by 2010 it had nearly doubled to 80 years old (Office for National Statistics [ONS], 2015). Advances in medicine have also led to more people living with disabilities and managing conditions that limit independence for longer periods. Survivability and life expectancy for individuals with previously fatal medical conditions have improved significantly (GBD 2015 disease and injury incidence and prevalence collaborators [Global Burden of Disease], 2016; GBD 2021 Diseases and Injuries collaborators, 2024).

Additionally, population growth driven by improved nutrition and public health measures has contributed to an increase in the number of people requiring care. While longer life expectancies are inherently positive, they come with the inevitable consequence of greater demand on both social and healthcare systems. In the UK, requests for social care support from local councils have risen by 11% between 2015/16 and 2022/23 (The King's Fund, 2024a).

This issue is projected to become even more pressing. Charlesworth *et al.* (2023) estimate that by 2040, 9.1 million people in England will be living with a major illness requiring community-based care, up from 6.6 million in 2019. Meeting society's growing demands for care is a critical challenge. One key solution lies in the provision of formal care services.

#### 1.3.3 Challenges Facing Formal Care

Formal care services encompass a wide range of professionally provided services designed to help individuals remain in their communities. These include home care assistants and care homes. In the United Kingdom, publicly funded care is typically organised and financed by local authorities through council tax and business rates (dependent on an individual's eligibility based on their financial circumstances). Local authorities play a central role in assessing individuals' care needs, determining eligibility for funding, and organising the delivery of care packages.

The process often begins with a request from a hospital or NHS partner seeking support for a patient requiring ongoing care after discharge or alternatively, individuals may approach their local authority directly. Although assessment procedures vary between local authorities, the process involves evaluating the individual's care needs, deciding how care will be financed, and determining the mode of delivery. One common concern is the length of time this process takes, from the initial request to care provision. This gap in need and provision inevitably draws in informal carers.

Before the England only Care Act 2014 (henceforth also referred to as "the act") there was no universal framework for assessing and delivering social care in England, with each local authority following its own procedures. Cost containment remains a priority for local authorities, many of which outsource care to private providers when they lack inhouse or arm's-length organisations to fulfil these services. However, unmet care needs are common, especially among those living alone, younger individuals, and those with severe disabilities (Dunatchik, Icardi and Blake, 2019). Forrester-Jones and Hammond (2020) attribute these unmet needs to national funding constraints, resource shortages, and difficulties in sourcing appropriate carers.

Local authorities face significant disparities in revenue and demand for social care. Some areas, such as seaside towns in the UK, experience higher care demands due to their aging populations but have reduced revenue streams due to economic decline and migration of younger residents. For instance, the decline in high-street businesses has reduced income from business rates, further straining local budgets.

The rising cost of formal care services adds another layer of complexity. According to Giebel *et al.* (2016), costs range from £6.60 for a delivered meal to £24 per hour for light-intensity tasks, and up to £66 per hour for specialised services such as wound care and injections. To fund social care, many local authorities have resorted to council tax increases, which are often unpopular but necessary. This budgetary tug-of-war frequently leads to reductions in service levels elsewhere.

The formal care sector faces chronic staffing shortages driven by systemic issues. Low pay, often comparable to less demanding retail jobs, pushes many workers to leave the sector for less stressful jobs. According to The King's Fund (2024b), social care vacancies peaked at 11% in 2021/22 and have remained consistently above 5%. High workloads, burnout, and limited resources exacerbate the situation, leaving staff unsupported and diminishing the quality of care.

A lack of clear career progression further discourages long-term retention, while the stress and poor mental health support associated with care work have led to attrition rates of 20–30% (Read and Feng, 2019). Systemic reforms, including better wages, investment in staff development, and improved working conditions, are urgently needed.

Brexit has also worsened staffing issues. The sector once relied heavily on workers from the EU; now, it increasingly depends on workers from non-EU countries such as India, Nigeria, and Thailand (McKinney and Sturge, 2023). Despite this shift, staffing shortages persist, with hundreds of thousands of vacancies remaining unfilled despite over 1.5 million people being employed in social care in 2022/23 (The King's Fund, 2024b). These challenges highlight the difficulty of relying solely on formal care services to meet societal care needs.

#### 1.3.4 The Role of Informal Carers

Informal carers, or unpaid carers, form a critical pillar of the care system. National Audit Office (2021) estimates there are around 7.3 million unpaid carers in England. Across the EU, about 17% of the population provides informal care, with figures varying from 34% in Greece to 19% in the UK (Zigante, 2018). Similarly, 18% of the U.S. population engages in informal caregiving (Greenwood and Smith, 2019). As populations get older on average, these figures are expected to rise. Brimblecombe *et al.* (2018b) estimates the number of individuals in receipt of care in England is approximately 2.1 million in 2015, projecting an increase to over 3.4 million by 2035 owing to these demographic shifts.

The literature provides a clear picture of the traditional informal caregiver. Studies by Carmichael, Charles and Hulme (2010), Urwin, Lau and Mason (2019) and Schmitz and Stroka (2013), show that caregivers are more likely to be female, unemployed, and in poorer health. When they are employed, they often earn lower wages and experience higher job intensity.

Increased female participation in the labour market and greater access to higher education have shifted societal expectations, reducing the pool of traditional caregivers. Women now face higher opportunity costs as they pursue careers over caregiving roles. Simultaneously, societal changes—such as smaller family sizes, fragmented families, and lower birth rates—have further reduced the availability of informal caregivers (Pickard, 2015; He and McHenry, 2016; Mommaerts and Truskinovsky, 2020).

Addressing these trends is critical to ensure that society's growing demand for care is met. As informal caregiving becomes less feasible for many, alternative solutions and possible financial incentives will be required to bridge the gap between demand and available resources.

# 1.4 Providing informal care: the current understanding

A significant shift in familial norms and expectations has broadened the scope of inquiry within the social sciences, drawing increased attention to diverse societal outcomes, including those related to children, crime, education, fertility, health, and marriage. Among these areas, the role of informal care has emerged as a particularly important focus. Traditionally, women have been the primary providers of informal care. However, as the division of labour within households has evolved, opportunities have expanded for women to assume roles beyond the traditional homemaker. Despite this progress, women still contribute the largest share of both informal and formal care. This ongoing trend has rightly drawn greater attention to the impact of informal caregiving on those who provide it.

Given the pivotal role informal carers play in social care, it is important to examine not only the extent of caregiving responsibilities but also the factors that influence willingness to provide such care. Understanding these factors is essential for addressing the challenges caregivers face and shaping policies that effectively support them.

### 1.4.1 The willingness to provide care

The decision to provide informal care is shaped by a complex interaction of emotional, practical and economic factors. Rapp, Ronchetti and Sicsic (2022) suggest that informal care often emerges as a necessary substitute for formal care, especially when formal services are either unavailable or financially out of reach. In such circumstances, families are compelled to step in, highlighting the critical role of informal caregivers when formal services fall short. Beyond the availability of formal care options, Broese van Groenou and De Boer (2016) argue the decision to take on caregiving responsibilities is also strongly influenced by factors such as general attitudes, the quality of the relationship between caregiver and recipient, and perceived barriers like financial constraints, geographic location, and the caregiver's own capacity to provide care. In contrast, Arksey and Glendinning (2007) contend that the caregiving decision is more multifaceted, with caregivers often balancing work obligations, limited public services, and the desire to maintain personal independence. This complexity introduces significant uncertainty for potential caregivers, as they navigate these competing demands.

Studies, such as Carmichael, Charles and Hulme (2010), have further contributed to understanding the relationship between employment and the willingness to provide unpaid care. Their findings suggest that individuals who are not in paid employment or have low opportunity costs are more likely to provide care. Furthermore, women, new mothers, and individuals with their own health issues are generally more inclined to take on caregiving roles, although this tendency is shifting as families increasingly face economic pressures that make foregoing employment more difficult. The authors also highlight that individuals in high-paying jobs may be less likely to assume caregiving duties, given the competing demands of their professional roles and the financial necessity of their earnings.

Heitmueller (2007) frames this issue as a "chicken or egg" dilemma, questioning whether the decision to provide informal care stems from a lack of formal care options or from personal and economic circumstances. This ambiguity emphasises the varied outcomes across different caregiving situations, which is a critical consideration for policymakers when designing care policies.

Future research may explore whether it could be more cost-effective to compensate informal caregivers directly, rather than encouraging them to remain in or enter the formal workforce to support the social care system. As demand for social care increases, policymakers will need to navigate this trade-off, particularly as traditional inequalities in domestic labour—historically filled by women, elderly individuals, and people with disabilities—are being addressed through policies that incentivise these groups to remain in formal employment. Given these complexities, it is increasingly vital to examine the trade-offs between maintaining formal employment and providing care, as this balance significantly influences both individual decision-making and broader policy considerations in the context of social care.

### 1.4.2 The trade-off between employment and caring

Several studies, including those by Carmichael and Charles (1998, 2003), Carmichael *et al.* (2008) and Carmichael, Charles and Hulme (2010), have demonstrated that providing informal care imposes significant labour market costs, especially for women. Caregivers often experience reduced wages, diminished attachment to the labour market, shorter working hours, and an increased likelihood of leaving the workforce altogether. The demands of caregiving often conflict with the structured and predictable nature of most

business environments. These findings are further supported by Bolin, Lindgren and Lundborg (2008), as well as Heitmueller and Inglis (2007a) and Arber and Ginn (1995), who point to the long-term negative effects caregiving can have on career progression. This phenomenon is not limited to the UK; studies from the US, include Stone and Short (1990), Ettner (1996), Johnson and Sasso (2000), Kolodinsky and Shirey (2000) and Pavalko and Henderson (2006), have shown similar patterns.

In contrast, some countries have implemented policies to mitigate the impact of caregiving on employment. In Germany, informal carers can access paid time off, similar to parental leave, which helps balance work and caregiving responsibilities. Auth, Leiber and Leitner (2023) emphasise the role of private care insurance and workplace policies in supporting informal caregivers. Similarly, Heymann *et al.* (2024) highlight policies in Japan and the US that encourage informal caregiving while supporting workforce participation.

Caregiving significantly influences retirement decisions, particularly for women. Heymann *et al.* (2024) found one in five (20%) women worldwide retire early due to caregiving responsibilities, compared to one in twenty men (5%). This trend is mirrored in national studies in Germany (Fischer and Müller, 2020) and the US (Dentinger and Clarkberg, 2002). Furthermore, young adult caregivers are also at risk of delaying their entry into the workforce, which can have long-term economic consequences. Research by Di Gessa *et al.* (2022) and Brimblecombe *et al.* (2020) suggest young carers face increased economic and health risks, which can affect their future financial independence and career development.

However, the financial burden of caregiving has sparked discussions about the potential of government compensation for caregivers, recognising the wages they forgo while providing care. At the time of publication there is an ongoing call for direct financial compensation, tax incentives, the removal of financial penalties for those that do care and receive some form of public welfare and for more recognition of the cost of care in personal financial allowances and support.

Elements of the Care Act 2014 aim to address the financial and employment penalties that occur for informal carers.

### 1.4.3 The health impact of providing informal care

While the Care Act 2014 addresses the financial strain on informal caregivers, it also encompasses the health and well-being of caregivers, by offering them support and inclusion in the decision-making process to improve the willingness and sustainability of informal care. The health implications of informal caregiving have been extensively studied with evidence showing that caregiving can have a detrimental effect on both the physical and mental health of informal carers. The consistent burden, isolation and potential lack of agency in the decision to provide informal care, bare costs. Research by Bobinac et al. (2010), Kaschowitz and Brandt (2017), Calvó-Perxas et al. (2018), Becker and Sempik (2019), Bom *et al.* (2019), Brimblecombe *et al.* (2020), Harris *et al.* (2020) and Heymann *et al.* (2024), have identified there is a health cost on informal carers that often goes unacknowledged in economic evaluations and often overlooked by health professionals, who are working within the confines of the established legislation, experience and expectations. In their systematic review of 22 papers, Janson *et al.* (2022) found informal caregivers experienced higher rates of severe stress, adjustment disorders, depression, diseases of mobility and chronic pain conditions compared to noncarers. They also had a higher prevalence of anxiety, hypertension, diabetes and a reduced quality of life. it is therefore not surprising, that the medication usage such as anti-depressants and anxiety related medication of informal carers is also higher according to Stroka-Wetsch (2022).

Informal carers often face significant challenges in accessing support and healthcare services. Studies by Glos (2023) and Williams (2012) identified the exclusion of informal caregivers in the healthcare provision narrative. When they do seek help, they are frequently deprioritised or taken for granted. Unlike their employed counterparts, informal carers lack access to time off, respite, or external support, which not only discourages them from seeking help but also prevents them from receiving the care they need, exacerbating their situation.

Higher healthcare utilisation by informal carers should not be surprising, formal carers and medical professionals have higher healthcare consumption due to the nature of their jobs (Anderson *et al.*, 2021). However, unlike these healthcare professionals who benefit from workplace support, human resources services, and legal protections, informal carers have historically lacked similar support or legislation tailored to their needs.

According to Pinquart and Sörensen (2007), the health of informal carers is also influenced by the type of care they provide and the specific care situation, requiring a personalised approach to their needs. This approach necessitates the coordinated efforts of various institutions across social care, healthcare, and public services.

While some studies, such as Shaffer and Nightingale (2019), suggest that informal carers' healthcare utilisation may be similar to that of non-carers, this conclusion is limited to the United States, where healthcare costs are directly borne by individuals, and informal carers may not have the time to respond to national surveys. Moreover, research by Bieber *et al.* (2019) challenges this view, pointing out that service users are more likely to be excluded or discouraged from seeking help if barriers to care are high and the administrative systems are not designed to accommodate them.

Focusing on young carers under 30, Becker and Sempik (2019) and Brimblecombe *et al.* (2020) find that young carers were more susceptible to poorer mental health and emotional difficulties than their non caring peers. These issues may develop more rapidly and have more prolonged consequences, which makes early intervention critical.

The literature clearly shows that there is a health cost for those providing informal care, which is exacerbated by the difficulties in accessing healthcare and support. Much of the research has focused on identifying diagnoses and healthcare utilisation patterns among informal carers, but it is equally important to recognise the link between poor health and employment outcomes. Given the higher prevalence of mental health issues among informal carers, policies and procedures within healthcare settings must be adapted to address their needs. The Care Act 2014 has made it easier for informal carers to access support, but effective coordination among all relevant parties is essential. Monitoring the health of informal carers is directly linked to their ability and willingness to continue providing care.

### 1.4.4 The suitability of informal care

Attention has also focused on the suitability of informal care in comparison to formal care. This has been explored in studies by Bonsang (2009), Urwin, Lau and Mason (2019), Liu (2021), Zhang, Sun and L'Heureux (2021), Bolin, Lindgren and Lundborg (2008), Bonsang (2009), Liu (2021) Hanaoka and Norton (2008), Sun *et al.* (2019), Urwin, Lau and Mason (2019), Lemmon (2020) and Zhang, Sun and L'Heureux (2021). The general consensus is that informal care is an appropriate substitute for formal care services when the tasks involved are basic and do not require advanced medical skills, such as bathing, dressing, and meal preparation. However, when care needs become more complex, such as in cases involving serious medical conditions, mobility issues, or behavioural concerns, formal care services are often preferred. This includes situations such as advanced stages of dementia, paralysis, or seizures, as well as cases where the caregiver may have their own health issues or be at risk if they provide care independently. The link between the effectiveness of informal care and the health of those providing it is another important consideration in this debate, as identified by Stöckel and Bom (2022).

The complementary relationship between formal and informal is also evident in the work of Van Houtven and Norton (2004) and Pickard *et al.* (2014). Knowledge exchange between informal and formal carers, which ultimately benefits both the patients and those providing care. However, this relationship hinges on the willingness of formal care services to view informal caregivers as equal partners and to challenge any preconceived assumptions about their superior knowledge (McPherson *et al.*, 2014; Fee, McIlfatrick and Ryan, 2021; Brimblecombe *et al.*, 2022). Further research is needed to assess whether a positive link is substantial in sustaining the provision of informal care through the coexistence of formal care services. Such research would require a comprehensive dataset containing detailed information on all parties involved, the type of care provided, and comparable situations where formal care was not involved. To date, this level of detailed data does not seem to be readily available in the public domain.

The provision of informal care can impact both individuals' willingness to accept formal care and the decisions of local authorities to provide it, as identified by Van Houtven and Norton (2004). When resources are limited, the availability of informal carers can affect the extent of formal care resources that local authorities are able or willing to allocate. Additionally, the decision to provide informal care may be influenced by the eligibility of care recipients for publicly funded formal care services, as noted by Stabile, Laporte and Coyte (2006) and Moussa (2019). Family and friends may feel compelled to provide care if publicly funded services are perceived as inadequate, infrequent, unreliable and insufficient. Moreover, the presence of formal care services does not necessarily relieve informal carers of their responsibilities entirely. Informal care has proven to be a viable substitute for formal care in many situations. This perception of suitability may, in turn,

influence local authorities, who might seek to transfer some of the financial burden to central government. Since central governments typically fund welfare benefits while local authorities manage formal care services, the former have a clear incentive to encourage informal care in order to reduce their financial obligations.

The effectiveness of informal care in achieving positive care outcomes remains a topic of debate. On one hand, informal care is associated with better mental health outcomes for recipients according to Barnay and Juin (2016) and can delay entry into nursing homes according to Van Houtven and Norton (2004). Several studies have shown that informal care can serve as an effective substitute for home care services (Charles and Sevak, 2005; Barnay and Juin, 2016; Liu, 2021). The familiarity, trust, and emotional bonds inherent in family caregiving often shield recipients from external market pressures and care challenges, helping them remain in a family-centred environment while maintaining strong relationships with their caregivers.

However, the growing demands of informal care can negatively affect the quality of care provided. As the caregiver's burden increases, there is a risk of unsafe caregiving situations (Yuda and Lee, 2016; Lindt, Van Berkel and Mulder, 2020). Greenberger and Litwin (2003) suggest that providing adequate support and resources for informal carers could help mitigate these challenges. Over time, the increasing strain of caregiving may necessitate formal interventions, particularly for individuals with chronic conditions (McClendon and Smyth, 2013).

While some evidence indicates that individuals with dementia may experience better daily living conditions at home compared to nursing homes (Olsen et al., 2016), the high level of care required for dementia patients can reduce the quality of informal care. In contrast, formal care settings, while equipped to handle such needs, can contribute to feelings of loneliness, depression, and abandonment, which can negatively affect the health of care recipients (Bom, Bakx and Rellstab, 2022).

The decision to seek formal care is complex and can represent a significant shift in an individual's life and sense of identity, as noted by Valokivi (2004). Navigating the UK's local authority system can be particularly challenging and may result in inadequate care packages that place additional pressure on family members (Valokivi, 2004; Janlöv, Hallberg and Petersson, 2005). This situation creates a dilemma for care recipients, who

may fear becoming a burden on loved ones (Janlöv, Hallberg and Petersson, 2005) and may disengage from decision-making about their care (Valokivi, 2004). Dissatisfaction with the care system is a significant factor in disengagement (São José *et al.*,2016) as is a feeling of powerlessness in decisions (Breitholtz, Snellman and Fagerberg,2013). Formal care can sometimes appear transactional, lacking in empathy and recognition (Themessl-Huber, Hubbard and Munro, 2007) and may lead to a loss of independence and further isolation (Stewart and McVittie, 2011). Financial concerns about state assistance (Heavey, Baxter and Birks, 2024), along with the absence of legal documents such as Lasting Power of Attorney (Mccann, Bamberg and Mccann, 2015), can further complicate the decision to seek help.

Informal care offers more flexibility and personalisation compared to formal care services, allowing recipients greater control over their care. The benefits of combining formal and informal care are well documented. Litwin and Attias-donfut (2009) found that the advantages of hybrid care depend on the severity of the care needed, with the most significant benefits observed in severe cases. This finding was supported by Chappell and Blandford (1991), who noted that hybrid care reduces demands on both formal and informal carers. DePasquale *et al.* (2016) identified beneficial instances of knowledge and skill transfer between formal care workers and informal carers. Wolff *et al.* (2018) suggested that personalised knowledge transfer from formal to informal carers could enhance care quality and potentially reduce the need for formal carers. It did not specifically address this knowledge transfer but the spirit of this was included.

In summary, this section has examined the suitability of informal care as a substitute for formal care services, emphasising its advantages and limitations. Informal care can effectively address basic care needs, offering flexibility and personalisation that formal care may lack. However, its sustainability requires careful monitoring to ensure that caregiver burden does not compromise the quality of care or negatively impact the wellbeing of both caregivers and care recipients. Collaborative dialogue and knowledgesharing between formal and informal carers have the potential to improve care outcomes, but this relies on a mutual willingness to engage and cooperate.

The availability of formal care services and eligibility for public funding significantly influence the reliance on informal care. Local authorities may face conflicting incentives,

shifting caregiving responsibilities onto families while attempting to pass financial burdens from local to central government. Furthermore, the decision to seek formal care is a profound and often challenging transition, shaped by emotional, financial, and logistical considerations. This complexity frequently leads to defensiveness and reluctance among care recipients and their families, underscoring the importance of supportive and empathetic care policies.

#### 1.4.5 The economic cost of informal care

While the personal costs of informal caregiving have been discussed, the broader economic value of the care provided remains equally significant. Numerous studies have attempted to quantify the monetary value of informal care worldwide. In England, Hu *et al.* (2024) estimates that informal care was valued at £54.2 billion in 2019 rising by 87% through 2039. Oliva-Moreno, Peña-Longobardo and Vilaplana-Prieto (2015) estimated the value in Spain ranged from 23 to 50 billion euros. Ekman *et al.* (2021) estimates that to replace informal care in Sweden with formal care would cost around SEK193.6 billion per year. Elayan *et al.* (2024) estimates that in the Netherlands informal care equates to a cost of between 17.5 and 30.1 billion euros. These are considerable costs for society and illustrates why policies to support, promote and sustain informal care are beneficial to government's when the alternative would require massive tax rises.

The methodologies underpinning these estimates vary. Common approaches include the replacement cost method, opportunity cost of time, proxy good method (market valuation of caregiving hours), and contingent valuation (assigning a self-determined wage to caregivers' time). While there are valid arguments for each approach, the replacement cost method is often considered the most practical. This approach estimates the cost of substituting all unpaid caregiving hours with formal care services, avoiding the complexity of calculating individual opportunity costs or wages foregone. Engel *et al.* (2021) identified this as the most widely used methodology. However, reaching a consensus on standardised valuation methods would enhance comparability both within this field and across related research disciplines.

### 1.4.6 Policies for informal carers

Policies supporting informal carers vary widely across the globe. Rocard and Llena-Nozal (2022) observed that, over the past decade, many countries have implemented legislation recognising the critical role of informal carers. Austria, Czech Republic, Germany and Luxembourg have introduced substantial measures aimed at assisting carers who balance caregiving with employment. Courtin, Jemiai and Mossialos (2014) noted the most common type of policy across the European Union focused on the financial needs of informal carers, this was then followed by respite care and training programs. However, the authors also identified a critical gap: most EU countries lack systematic processes for identifying informal carers and assessing their individual needs. This oversight risks leaving many carers unsupported despite policy advances.

England introduced the Care Act 2014 to address the needs of informal care and those requiring care, with Carers UK (2023) describing the acts provisions for informal care as revolutionary. The Act granted informal carers formal recognition, involvement in care-related decisions, and rights to access services and support linked to their caregiving roles. Similar legislation has been implemented in other parts of the United Kingdom, with Scotland introducing its equivalent in 2018 and Wales in 2014. However, Northern Ireland has yet to introduce its own comprehensive policy for informal carers.

Policy advancements are not limited to the UK. Germany restructured its long-term care insurance to include provision for respite care and support for informal carers. Germany also permits carers to take employment breaks for up to six months, helping them remain connected to the labour market (Eurocarers, 2024). The Republic of Ireland introduced its National Carers' Strategy in 2012, focusing on identifying informal carers and enhancing access to support services. Since 2020, the country has implemented a Carer Needs Assessment to provide tailored support for carers. Globally, the nature of policies supporting informal carers varies. Some countries, including the UK, Germany, and Poland, offer carers the right to an individual assessment of their needs. Others, such as Poland, Belgium, and Germany, focus on labour market support to help carers balance employment and caregiving responsibilities. These differences highlight the diverse approaches governments take to address the needs of informal carers across the world.
### 1.5 Young carers

The final part of this review examines the literature on young carers. Compared to the extensive research on adult informal carers in the field of economics, studies on young carers remain relatively sparse. However, significant contributions from public health and medical research have laid a foundation for understanding the impact of caregiving on this group. In their systematic review, Lacey, Xue and McMunn (2022, p. 1) found young carers tend to experience poorer physical and mental health on average than their non-caregiving peers. Despite analysing evidence from 1,162 studies, the authors describe the findings as "relatively weak" and emphasise the need for more robust quantitative research, particularly longitudinal studies assessing physical health outcomes.

This challenge is compounded by the variability in experiences and developmental changes typical during adolescence. While health outcomes are not the focus of this analysis, this review of the literature provides valuable context for understanding the unique challenges faced by young carers.

#### 1.5.1 Defining young carers

The definition of young carers remains unclear due to a lack of consensus on the age range that should apply, contributing to confusion in the literature. Aldridge and Becker's (1993) pioneering study defined young carers as individuals under 18. However, this definition became more complex when Becker and Becker (2009) introduced the term "young adult carers" to refer to those aged 16 to 24. This ambiguity continued with Brimblecombe *et al.* (2020) expanding the age range to 16 to 25, and Di Gessa *et al.* (2022) extending it further to include those up to 29.

These varying age definitions present significant challenges, as they fail to account for the distinct experiences and developmental stages of young carers. Understanding the impact of caregiving on young people requires a more nuanced approach that considers their specific life stages. To achieve greater clarity, we will adopt a more focused definition, identifying young carers as individuals under the age of 18, with a particular emphasis on those aged 14–16, a period often referred to as "Middle Adolescence."

This focus is valuable because individuals in this age group are typically nearing the end of secondary school, a transitional phase marked by significant developmental and societal changes. After turning 16, individuals gain greater independence and legal rights, including the ability to marry, leave home, secure full-time employment, and seek housing support from local authorities. These milestones signify a substantial shift in autonomy, which distinguishes the experiences of those aged 16 and older from younger adolescents. By focusing on carers in middle adolescence, we aim to provide a clearer understanding of their unique challenges during a critical stage of their development.

#### 1.5.2 The impact of being a young carer

The limited body of economic literature addressing young carers has examined their economic outcomes but is marked by notable limitations. For instance, Di Gessa *et al.* (2022) controversially includes those from 16 to 29 as young carers with the mean age in their models exceeding 20 years. Similarly, Brimblecombe *et al.* (2020) includes individuals aged from 16 to 25 with their analysis based on the baseline of those individuals first appearing in the survey rather than focusing on specific age groups.

Both studies highlight that individuals who provide care during these formative years are socioeconomically disadvantaged, experience poorer health, and are more likely to be unemployed or have exited employment compared to their non-caring peers. Di Gessa *et al.* (2022) provides a largely descriptive analysis of the differences of young carers and their non-caring counterparts. In contrast, Brimblecombe *et al.* (2020) employs a propensity score matching (PSM) method to compare carers and non-carers. However, Brimblecombe et al's analysis is limited by its inability to capture long-term effects, with arbitrary timeframes of two years intersecting the period of first appearance and the first period after that do not account for specific age-related dynamics, with these periods accounting for carers between the ages of 16 and 25 combined.

While both studies contribute valuable insights to the discourse on young carers and their outcomes, they also present significant opportunities for further development. Future research could address these limitations by adopting a more age-specific focus and longer time horizons to better understand the enduring economic and social impacts of young carers.

### 1.6 Conclusion

This literature review has identified significant gaps in the existing body of research. While there is an extensive body of work examining the impact of informal care on adult carers—addressing outcomes such as employment, wages, health, willingness to provide care, and the suitability of informal care—there remains a need for further evaluation. The review briefly explored global policies supporting informal carers and identified the Care Act 2014 in England as a noteworthy legislative effort to address these issues. However, there is a pressing need to assess the effectiveness of this legislation in promoting the uptake and retention of informal carers, which will be the focus of Chapter 2.

The review also underscored the scarcity of literature on young carers and the challenges posed by inconsistent definitions of this group. The lack of a standardised definition complicates both existing research and future studies in the field. A more unified definition, agreed upon by researchers and policymakers, is essential for advancing this area of inquiry. Despite these definitional challenges, a critical gap exists in understanding the long-term impacts of caregiving on young carers, particularly those in middle adolescence. Chapter 3 will address this by evaluating how providing informal care during this formative period affects outcomes in early adulthood.

End of Chapter One

## 2 Chapter Two: An ex-post evaluation of the Care Act 2014: The impact on the supply and retention of informal (unpaid) carers

### 2.1 Abstract

Society's demand for care is increasing as the population ages, with formal care being costly and in limited supply. Whilst widespread, informal care involves significant societal costs, particularly for those providing the care. This includes poorer mental health, less attachment to the labour market, reduced human capital accumulation and ongoing financial penalties. But the traditional informal carer is in decline. Women have better equality in the workplace, care episodes are increasing in length, families are more fragmented, financial concerns abound and a persistent unwillingness to be a carer. Addressing these issues, the English "Care Act 2014" (Act) was introduced to support the uptake and retention of informal care. Considered revolutionary by charities, the Act established a legal framework, including informal carers in decision-making and granting them recognition and access to support. A subsequent natural experiment arose from the 3-year temporary divergence in equivalent legislation between England and Scotland, who introduced their own Act in 2018. This divergence allows for a difference-indifferences strategy, evaluating the impact of the Act on uptake and retention of informal carers. With additional analysis across employment status and personal income. By employing UK longitudinal data my results suggest the Act increased the uptake of care modestly between 0.9% and 2.3%, primarily those under the age of 50 in general and across employment status and personal incomes. The impact on retention was relatively larger. Retention rates were between 4.2% and 8.2% higher, primarily for those over 50 years old in general, across employment status and personal incomes. These results are encouraging but must be viewed as part of an evolving society, where more people require care and less people want to provide it. Raising public awareness, improving support access, and fostering collaboration between institutions are key to the Act's effectiveness. Labour market, social welfare and public health reforms should be pursued alongside the Act to address the broader economic challenges experienced by carers.

### 2.2 Introduction

The demand for social care is rising in response to an aging population, and in the UK, informal care—also referred to as unpaid care—already plays a crucial role in the overall provision of social care. The National Audit Office (2021), estimates there are approximately 7.3 million unpaid carers in England, with additional estimates ranging from 5 to 10.6 million, according to Carers UK (2019), which outnumber the one and a half million workers in the United Kingdom's formal social care sector in 2022/23 (Foster, 2024). Persistent challenges within the formal care sector exacerbate the demand for informal carers. Issues such as low wages, unsociable working hours, insecure contracts, and intense competition for low-skilled workers contribute to a high turnover rate and result in numerous vacancies remaining unfilled. However for many tasks, informal care is a suitable substitute for formal care according to Van Houtven and Norton (2004) and Bonsan (2009).

But Informal care is not without consequences. Academic research, including Heger and Korfhage (2020), Schmitz and Westphal (2017), Tokunaga and Hashimoto (2017) and Bolin, Lindgren and Lundborg (2008), has offered valuable insights into the wide-ranging costs borne by informal carers in the provision of care. These include, deteriorating mental and physical health, economic and labour market repercussions, with inflexible employers, wage penalties and an increased likelihood to leave the labour market. It is crucial to increase the support available to sustain informal carers, keep costs down and prevent additional pressure on the already overstretched, understaffed and costly formal care sector. But it is also important that additional harm is not caused, as a result of providing informal care. After all, who cares about the carers?

In this chapter, my contribution will involve evaluating the impact of the English Care Act 2014 (henceforth referred to as "the Act") on the uptake and retention of informal carers in England. This piece of legislation has been labelled as revolutionary by charities for its inclusion of informal carers (Carers UK, 2023). The Act introduced significant reforms, with the aim of improving the lives of both those receiving care but in particular those providing it. Placing informal carers on an equal footing with care recipients, the legislation empowered carers with greater input into care decisions and offered them enhanced support for their own wellbeing (Marczak *et al.* 2022). Local authorities (LA's) and health services now have an obligation to provide services and support designed to

sustain informal care arrangements and delay the need for formal care intervention. These measures were expected to increase the number of individuals willing to take on informal care responsibilities and improve the retention of existing carers by giving them more autonomy over their caring role, like those seen in primary care (DeSocio, Kitzman and Cole, 2003). Ultimately by reassuring carers that services will be there to support them in their role as a carer but also in leading a normal life, should contribute to a more sustainable informal care sector (Singh *et al.* 2015a). I believe the significant reforms provided for in the act should encourage more individuals to provide informal care and improve retention rates. When faced with a demand for care individuals should be reassured that providing care will be accompanied by support and inclusion in decision making.

It is however vital that policies are evaluated to ensure they are fit for purpose and to address any shortcomings in the expected outcomes. This evaluation shall be achieved by adopting a difference in difference (DiD) model using a British longitudinal dataset (UKHLS), the "Understanding Society Survey"<sup>1</sup>. This approach has been motivated by a deep literature review, in which the consequences of providing informal care are in part addressed by this act and subsequently a natural experiment has emerged. The legislation affecting informal carers diverged temporarily between England and Scotland. England introduced their Act on the 1<sup>st</sup> April 2015, with Scotland introducing their equivalent 3 years later in 2018. This 3-year period will be the treatment period for England with the same period in Scotland acting as the control. This should be a sufficient period of time for the effects of the act to manifest. Scotland provides a suitable comparison because of its shared history with England. Both are members of the United Kingdom, share similar demographic challenges and trends but also adopted this legislation to achieve the same goals. England being the first mover. To the best of my knowledge there has been no evaluation of the Act's impact on the uptake and retention of informal carers to date, this will be the contribution of this paper in filling this gap in the literature, adding conclusive evidence on the acts impact but also contributing to the

<sup>&</sup>lt;sup>1</sup> University of Essex, Institute for Social and Economic Research. (2023). *Understanding Society: Waves 1-13, 2009-2022 and Harmonised BHPS: Waves 1-18, 1991-2009.* [data collection]. *18th Edition.* UK Data Service. SN: 6614, <u>DOI: http://doi.org/10.5255/UKDA-SN-6614-19</u>

continuing discourse on informal carers. This study will provide estimates for the overall effect of the act on the uptake of informal care and retention of informal carers, in England, using Scotland as a control. This study will split the sample by age (50 and over and under 50) to address concerns that those approaching retirement may have different incentives and demands to provide care. Additional models that address the effect of the act based on employment status and personal incomes are also considered.

This approach has yielded results that indicate the act increased carer uptake by between 0.9% and 2.3% across both employment status and personal incomes. However, the improvement in uptake appears to largely be isolated to those under 50 years old. Carer retention increased between 4.2% and 8.2% across employment and personal incomes. Much like uptake the effect is age dependent, increased retention rates are in contrast isolated to those over 50 years old. These will be encouraging to policy makers but signify there is additional efforts needed to address the growing demand for social care and the costs in providing informal care.

The structure of the paper is as follows. Details of the Act will be outlined in section 2.3. In section 2.4 background details and a literature review are presented with a focus on the intersection between carers and the act. However, I encourage the reader to have previously read chapter 1 on page 18 of this thesis to provide a deeper comprehension of the situation. The data, modelling strategy, sample and empirical suitability will be presented in section 2.5. The results on carer uptake and retention are presented in 2.6. A summary of the results is presented in section 2.7. A discussion on policy and the suitability of Scotland is presented in sections 2.8. A conclusion finishes this chapter in 2.9. Additional results and robustness checks are presented in the appendix, 2.10.

### 2.3 The Care Act 2014 – How it impacts informal carers

The Care Act 2014 was introduced to address some of the concerns raised by charities and informal carers. These included lack of access to support in their role as an informal carer, no recognition in the decisions made about the individuals care and a lack of support to assist them to lead a life outside of their caring responsibilities, which includes respite. By including a universal right to seek an assessment for support the act put informal carers on an equal footing in accessing support alongside those receiving care. Local authorities were now obligated to address the needs identified in these assessments. By including informal carers in the legislation, the Act not only recognised their contributions but also acknowledged the support they would require in providing care.

The Care Act 2014 only applies to England due to the devolved legislative structure of the United Kingdom. It was introduced to Parliament on 9th May 2013, received royal assent on 14th May 2014, and came into effect on 1st April 2015. This legislation addresses the needs of all adults in England who require care and support, replacing most of the existing laws concerning both carers and the individuals they care for.

The Charity (Mencap, 2024) highlights the main changes for informal carers:

- A carer will be entitled to an assessment if it appears that a carer needs support. The carer's assessment must establish whether the carer is willing and able to continue providing care to the person they are caring for, what impact this has on the carer's wellbeing, what outcomes the carer wishes in day-to-day life, and whether the carer wishes to access education, training or recreational activities.
- The carer will have the same rights to an assessment and support as the disabled adult themselves. Therefore, once a carer's assessment has been carried out, the local authority will see which of the carer's needs are eligible for support and will then produce a support plan to meet the carer's needs.
- Local authorities are under a duty to meet a carer's eligible needs, subject to financial assessment.

These significant reforms aimed at improving support for informal carers are expected to enhance both the uptake and retention of informal caregiving roles. By granting equal rights and access to needs assessments, the legislation prioritises the wellbeing of carers, recognising their vital contributions to the care system. Unlike previous laws that focused primarily on those providing substantial, regular care, these reforms extend support to all carers, requiring local authorities to actively identify them and assess their needs. This shift empowers carers by involving them in care-related decisions and providing greater control over service delivery through direct payments. Additionally, the reforms entitle carers to respite breaks, allowing them crucial time to pursue work, education, or family commitments, thus alleviating some of the overwhelming demands of caregiving.

By fostering a supportive environment, these reforms not only encourage individuals to take on unpaid care roles but also help ensure that those already providing care feel valued and supported. As a result, informal carers are more likely to remain in their roles, leading to a sustainable care system that eases the burden on formal care services

### 2.4 Background: How informal care impacts individuals

Please view the original chapter in this thesis for a complete picture of informal care in chapter 1, for further information regarding the growing demand for social care, the dynamics in formal care and the changing landscape in informal care. I shall provide a brief synopsis of this section excluding citations to remind the reader.

There is a growing demand for social care as people are living longer and living with more chronic conditions than ever before. Formal care services are stretched and expensive. Fewer people want to work in this sector due to the wages offered and the burden of this type of work. Traditional informal care providers are in decline, along with fragmented and single parent households changing the makeup of households and the ability and willingness to provide care. Failures in the formal care sector are increasing the burden on informal carers such as family members and friends. Providing informal care impacts those considerably.

#### 2.4.1 The cost of informal care

Providing informal care comes with its own challenges and consequences. The Act has addressed some of the consequences identified in the literature. These include the mental burden on informal carers. Informal caregivers often experience lower mental health and higher antidepressant use (Schmitz and Stroka 2013 and Estrada-Fernández et al. 2021). This strain can affect not only the caregivers but also their families, including children. By legislating for better access to support services, the Act aims to make informal caregiving more sustainable and less detrimental to carers' lives. Before the Act many carers were faced with a patchwork of differing support depending on local authorities. Brimblecombe et al. (2018a) reviewed support services for informal carers, noting that most services target those providing intense care, particularly for individuals at the end of life or suffering from conditions like dementia and cancer. These services addressed some of the physical and mental burdens of caregiving. However, the exclusion of carers dealing with lower-intensity tasks and those with limited financial support was evident. This has been addressed in the Act. Fernandez et al. (2019) pointed out that "rights, without resources due to budgetary constraints, to provide those rights to carers are the major hurdles facing carers." Indicating that resources and money will be needed to

address these issues in providing support. The cost of supporting carers is likely to be lower than a publicly funded care package. But the inclusion of training and support should be seen in isolation. Providing care is also an element of the Act. Rodríguez-González, Rodríguez-Míguez and Claveria (2021) demonstrated that the burden on carers can be alleviated through the provision of aids, training, and strategies for managing behavioural issues and workload. This burden intensifies with the severity of the dependent's needs, so promoting independence can benefit all parties involved. The ability to sustain caregiving often depends on the complexity of tasks and the impact on carers' health. While informal care may suffice for basic, non-specialist needs, it is not a replacement for formal care in more complex situations. Singh *et al.* (2015) emphasised that government intervention, including legislation, is necessary to identify when formal care is required and where informal care alone is no longer sufficient.

Engaging all stakeholders in the provision of care can yield positive knowledge transfers in a hybrid system that combines both formal and informal care. Brimblecombe *et al.* (2018) and Pickard *et al.* (2014) argued that paid services enable informal carers to balance work and caregiving, and that sharing knowledge and strategies can ease the burden, allowing more carers to stay in the labour market. However, Brimblecombe *et al.* (2018) also identified significant barriers to accessing formal care services and possibly interacting with them, such as availability, openness, geography, financial, quality, and the inclusive attitudes and willingness of both informal carers and care recipients. One of the Act's aims is to foster greater involvement among all parties, not to leave informal carers adrift. However, many carers may hold desires to lead a normal life in parallel with caring.

The Act has adopted elements to provide support for carers to lead a normal life balancing their caring responsibilities with other aspects of their life. This includes employment. Informal caregiving reduces the likelihood of being in paid employment by over 10% according to Nguyen and Connelly (2014). Lower wages and reduced career progression are common among those who take on caregiving roles (Carmichael, Charles and Hulme 2010; Carmichael and Charles 2003; Heitmueller and Inglis 2007; Van Houtven, Coe and Skira 2013). Although this is one area the Act focuses on, there is also a requirement for labour market reforms that support informal carers and overcomes some of the barriers and difficulties carers face. Consider a situation where a husband has a heart attack.

Currently the UK has no labour market rules that would allow a wife or partner to take a long period of leave whilst keeping their job or reducing this to part time hours, these types of policies are already well established in Germany. However, there is a trade-off between encouraging informal care and labour participation, especially in economies dominated by informal care.

Geyer and Korfhage (2018) found that long term care reforms aided the number of men, a non-traditional source of care, providing care. So successful policies are achievable. With additional support for carers, we may see a decrease in a carers likelihood to exit the labour market or movements into more flexible lower paying jobs, as found by Schneider *et al.* (2013) and Geyer and Korfhage (2018). Where these are costly to individuals and firms there is an incentive to adjust working practices. In the post covid period a significant culture in the labour market has seen remote working (WFH) grow both in its prevalence but also in the demands of potential employees. These also have benefits for carers with the ability for more flexibility and not having to leave the home benefitting the jobs prospects of carers. The data available for this will become available in the near future with this an avenue for future research. However, are we able to predict who will be an informal carer.

It is essential to consider self-selection based on opportunity costs and willingness to provide care. These dynamics vary across generations, social classes, and income levels (Zarzycki *et al.*, 2023). Lower-income individuals, facing fewer employment opportunities, may find caregiving a more viable option, especially if it leads to financial stability through social welfare. Conversely, wealthier families, who face higher opportunity costs, are more likely to seek formal care services, reducing their involvement in unpaid caregiving. Understanding these dynamics is crucial for evaluating their impact on formal care systems. To meet all of society's social care demands ensuring informal carers are represented across all demographics will be necessary to ensure informal care is suitable and sustainable. This may require further developments in labour market legislation and social welfare support. Ensuring that informal care is both voluntary and universally possible should be a significant aim for policy makers.

#### 2.4.2 Summary

In conclusion, while the Care Act covered various areas of social care, for informal carers it seeks to empower and make caregiving more sustainable, however significant challenges remain. The Act's success will depend on its ability to balance support for carers with the ongoing demands of everyday life, employment, and personal wellbeing. Policymakers must ensure that informal care is not disproportionately borne by the most disadvantaged in society, as this could exacerbate long-term reliance on formal care services and perpetuate cycles of disadvantage. Further research could explore how additional supportive legislation might enhance the sustainability of informal care and its integration with formal care systems, to allow knowledge transfers in a hybrid model. The following section will address the data used to evaluate the impact of the Act.

### 2.5 Data and methodology

This section outlines the data and methodology used to estimate the impact of the act, using a Difference-in-Differences (DiD) approach. The analysis relies on data from "The Understanding Society Longitudinal Study<sup>2</sup>(UKHLS)", from 2009 to the 1<sup>st</sup> April 2018 and only includes observations from England and Scotland. The DiD approach is used to estimate the causal effect of the act by comparing the pre- and post-treatment outcomes between the treatment and control groups. The identifying assumption is that, in the absence of the treatment, the treated and control groups would have followed parallel trends in the outcome variable (Carer uptake and retention). This assumption is crucial for the validity of the DiD estimates. Therefore, this section will provide a comparison of these samples.

#### 2.5.1 The Dataset

The UKHLS, is a comprehensive and nationally representative survey conducted in the United Kingdom. Employing a longitudinal approach, the study captures data from the same individuals and households across multiple waves, enabling researchers to examine social and economic circumstances over an extended period. With a commitment to representativeness, the survey encompasses diverse demographics and socioeconomic backgrounds, and its multidisciplinary data collection covers aspects such as social dynamics, economic factors, health, and demographics. The repeated waves of data collection, combining panel and cross-sectional components, contribute to a nuanced understanding of both short-term and long-term trends in the lives of participants. Researchers leverage this rich dataset to investigate a myriad of social and economic phenomena, conduct policy evaluations, and explore the determinants of various outcomes. These have included examining the effects of socio-economic factors on biological health (Whitley *et al.*, 2024), the impact of food expenditure on mental health (Waqas, Iqbal and Stewart-Knox, 2024), the impact of universal credit welfare payments

<sup>&</sup>lt;sup>2</sup> University of Essex, Institute for Social and Economic Research. (2023). *Understanding Society: Waves 1-13, 2009-2022 and Harmonised BHPS: Waves 1-18, 1991-2009.* [data collection]. *18th Edition.* UK Data Service. SN: 6614, <u>DOI: http://doi.org/10.5255/UKDA-SN-6614-19</u>

on the health of children (Song *et al.*, 2024) and post initial retirement returns to the workforce (Platts and Glaser, 2024).

This dataset includes broad information on individuals and households across the United Kingdom. In particular it includes information about caring responsibilities. It asks the individuals if they provide unpaid care to someone who is disabled or handicapped, inside and/or outside their own household. It also includes information on the relation to those being cared for. For this paper the question on whether someone provides care to someone inside and/or outside the household will identify informal carers.

The sample in this paper will be restricted to those in England and Scotland, from the 8<sup>th</sup> January 2009 up to the implementation of the Scottish Act, 1<sup>st</sup> April 2018. This sample is drawn from waves 1 to 10 of the UKHLS.

#### 2.5.2 Dependent variables

In this paper I shall be evaluating the impact of the Act on two outcomes.

<u>Carer Uptake:</u> In the first model, I will be evaluating the likelihood to become a carer having not previously been a carer (i.e. a new carer). This will be based on a binary variable 0 and 1, where 1 means someone who is a carer at period t (i.e. current wave), conditional on not caring in the previous period, t-1. Given that I am evaluating transitions into caring, anybody who in their first appearance in the survey was providing care, has been dropped from the sample. In addition to this, once someone has become a new carer in time t, they will then be dropped from the sample in the subsequent period t+1. For example, if someone is not a carer in wave 1 but becomes a carer in wave 2, they will not appear in wave 3 and are subsequently dropped from the sample. They do not re-enter the sample, even if caring stops. Further information on why care has stopped and begun again would have been a beneficial inclusion in the dataset's questions. My sample will therefore only include people who are not caring and those who have become a newcarer.

<u>Carer retention</u>: In this second model, I will be evaluating the likelihood of becoming a new non carer (i.e. stop providing care), conditional on previously providing care. In particular, this will also be a binary variable 0 and 1, where 1 means someone who does not provide care at period *t* (current wave), conditional on providing care in the previous

period, t-1 (previous wave). That is, someone who no longer providing informal care. Given that I am evaluating transitions into noncaring, anybody who in their first appearance in the survey was not caring has been dropped from the sample. In addition, to this once someone has left their caring responsibilities at time t, they will then be dropped from the sample in the subsequent period t+1. They do not re-enter the sample, even if caring starts again. My sample will therefore only include people who are caring and those who have become a newnoncarer (is now not providing care), for one period.

The understanding of this is important for interpretation. In the carer retention models: a negative coefficient (i.e. difference in difference figure) will refer to a reduction in people leaving care, they are less likely to become a new non carer. Therefore, retention has improved/increased.

#### 2.5.3 The Difference-in-Differences (DID) methodology

Difference-in-Differences (DiD) is a statistical method designed to estimate the causal impact of a treatment, policy, or intervention, by comparing changes in outcomes over time between a treated group and a control group. The fundamental concept involves accounting for time-invariant differences between the groups by analysing the differences in outcome variables before and after the treatment. A central requirement for the DiD method to identify causal effects is the Parallel Path Assumption (PPA). This assumption posits that, had the treatment not occurred, on average, the outcome variables—in this case, newcarer and newnoncarer—follow the same trend for both treated group (England sample after the Act's introduction) and control group (The Scottish sample between England introducing their Act on 1<sup>st</sup> April 2015 and the introduction of the Scottish Act on 1<sup>st</sup> April 2018) if the treatment had not occurred.

Another requirement for DID to identify the causal impact of a policy, is to exclude the possibility that there were changes in informal care provision prior to the introduction of the Act, for example due to anticipatory behaviour in their response to the forthcoming policy. To the benefit of this paper regrettably, the enactment of the legislation did not promptly coincide with a widespread public announcement, resulting in diminished awareness among the target beneficiaries, as well as individuals and institutions within social care, the National Health Service (NHS), and local authorities. Therefore, I believe

that such anticipatory effects are not expected here, although this is something I test in the appendix and summary section.

#### 2.5.4 Carer uptake - (DID) Equations

All of the models incorporate either the XT Logit or XT Probit commands in stata to account for the longitudinal nature of the data, followed by the random effects command and clustered by the individuals identification number.

Our two dependent variables are binary in nature. For our first model 'Transition into care', the dependent variable will be  $Y_{i,t} = 1$  if  $carer_{i,t} = 1$  but  $carer_{i,t-1} = 0$ , and  $Y_{i,t} = 0$  otherwise. See Equation 2.5.4-1. There, the dependent variable,  $Y_{i,t}$ , takes a value of 1 if the individual is a newcarer in time *t* conditional on them not being a carer in the previous period (*t*-1). For this model, individuals who were already providing care in the wave they make their first appearance were excluded, (i.e. if  $carer_{i,t=1} = 1$ ). In Equation 2.5.4-1, I build a non-linear model for  $carer_{i,t} = 1$  conditional on  $carer_{i,t-1} = 0$ , that includes the necessary dummy variables for being either in treatment or control group and for before or after the Act, as well as the interaction term between the two, and conditional on a set of variables *Z*. Allowing for non-linearity is important, due to the binary nature of the outcome variable.

#### Equation 2.5.4-1: Probability to provide informal care

$$Pr(Y_{i,t} = 1 | Z) = Pr(carer_{i,t} = 1 | carer_{i,t-1} = 0, Z)$$
$$= F(\beta_1 + \beta_2 C_{i,t} + \beta_3 A_{i,t} + \beta_4 A_{i,t} C_{i,t} + \gamma' Z + u_i)$$

 $F(\cdot)$  is a cumulative distribution function restricted to take values between 0 and 1, defining the conditional probability that  $Y_{i,t} = 1$ . Several models are available to build  $F(\cdot)$ , but in this study the logistic cumulative function has been chosen (Probit results are very similar and are available in the appendix) and  $u_i$  is the time-invariant unobserved heterogeneity that impact on transition into caring.

The variables of interest are *C* and *A*, and their interaction term *C* x *A*.

*C* is a dummy variable for England, taking a value of 1 if the individual resides in England, where the Act was implemented (i.e. the treatment group), and 0 if resides in Scotland where no equivalent Act was implemented during this study (i.e. the control group).

*A* is the post-act dummy, which is equal to 1 if an observation is observed after the Act was fully implemented on the 1<sup>st</sup> April 2015, and equal to 0 if the observation is before this period.

As the model includes the *C* x *A* interaction, in a linear setting, the coefficient  $\beta_2$  would correspond to the difference in the probability to transition into care between England and Scotland before the Act, while  $\beta_3$  would correspond to the difference in the probability to transition into providing care between the post-Act and pre-Act, period but for the control group, Scotland. It is vital to remember that for the DiD strategy to identify the causal effect of the Act, the 'parallel paths' assumption (PPA) must hold, which, as explained earlier, means that the average outcome would follow the same trend for the two groups, had the Act not been implemented. If so,  $\beta_3$  is then interpreted as the counterfactual, i.e. how much the probability to transition into providing informal care would change in England if the care act was not implemented.

Therefore, the main focus of this study is  $\beta_4$ , the coefficient of the interaction term between the England and Post-Act dummies. This coefficient determines how much higher/lower the change in the probability to transition into care differs between England and the control group, Scotland. Then, if PPA holds,  $\beta_4$  corresponds to the causal impact of the Act on the probability to becoming a carer. As mentioned earlier, note that if this was a linear model (i.e. a Linear Probability Model),  $\beta_4$  would be the standard DiD coefficient.

It is not straightforward to argue the parallel paths assumption holds true here, as there are many things that may have changed in different ways between England and our control, Scotland, over this period that affected the propensity to provide informal care in different ways. To control for such differences, our models include several control variables, denoted by vector Z.

To start with, Z includes a number of variables for employment status, income, education, personal and family characteristics, in the previous period t-1 (i.e. at the time before potentially becoming a carer). Previous research has indicated the influence of these factors in caring decisions. For example, prior research has shown lower income and being unemployed is associated with an increased likelihood to transition into informal caring. The same influence is seen on the impact of disability. As these characteristics may

differ between Scotland and England, it is important that these are controlled for in the models. It also includes variables for *age* and *age* squared and a number of time-invariant characteristics, such as gender and ethnicity, which are also potentially important determinants of the outcome. Importantly, *Z* also includes a time trend using the variable for the *wave* of the survey, to capture the general linear trends in the outcome variable.

As the model has a non-linear random effects structure – the random effects is due to the individual heterogeneity component assumed to be uncorrelated with the explanatory variables – it is estimated using Maximum Likelihood Estimation (MLE). In particular, the Random Effects (RE) Logistic regression is used, which accounts for serial correlation due to the individual heterogeneity term  $u_i$ . To allow for other potential sources of serial correlation, which would bias the standard errors (SE) of the model, the model has used clustered SE's dependent on an individual's personal identification number, assuming that each individual is a unique cluster.

#### 2.5.5 Difference in difference estimator - (DID) equations

Due to the nonlinearity of the RE Logit model,  $\beta_4$  is not interpreted as the effect of the Act. To calculate this effect, I need to calculate appropriate predicted values (i.e., predicted probabilities) and marginal effects (i.e., differences in these predicted probabilities) following estimation of Equation 2.5.4-1. That is, the DiD effect is estimated as:

#### **Equation 2.5.5-1: Difference in Difference estimator**

$$\widehat{D\iota D} = \left(\Pr(Y=1|\widehat{C}=1,A=1) - \Pr(Y=1|\widehat{C}=1,A=0)\right)$$
$$-\left(\Pr(Y=1|\widehat{C}=0,A=1) - \Pr(Y=1|\widehat{C}=0,A=0)\right)$$

(please note subscripts have been removed for convenience) i.e. the difference in the predicted probability to transition into providing informal care, before and after the act was implemented in England, minus the difference in this probability before and after the Act in Scotland. Under PPA, this second difference is the counterfactual.

These probabilities are calculated using the estimated results of Equation 2.5.4-1 using the postestimation "margins" command in the "Stata" software package. This produces predicted probabilities and marginal effects see Table 2.6.1-2, based on the regression models estimates, for example those regressions presented in Table 2.6.1-1. These

marginal effects are particularly valuable in the context of non-linear models, such as logit or probit regressions, where the interpretation of model coefficients may not be immediately straightforward.

Following a simple Logit model,  $logit\,y\,x_1\,x_2$ 

- Margins, at(x<sub>1</sub> = x1, x<sub>2</sub> = x2), calculates the predicted value of y at the two specified values x1 and x2
- Margins, dydx(x1), calculates the Average Marginal Effect (AME) of x1. That is, firstly, Stata calculates the marginal effect of x1 for every observation, assigning the values of x2 as they appear in the sample. That corresponds to n estimated marginal effects (where n is the sample size). Stata next calculates the average of all these effects, corresponding to the AME of x1.

In this paper I adopt the Average Marginal Effect approach:

- Initially: **margins**, **Act\_inception**, **at(England = (0 1))**, calculates the predicted probability of Y=1 (newcarer = 1) both before and after the implementation of the Act, separately for Scotland and England.
- These results are presented in the first four rows of Table 2.6.1-2 (labelled Pre & Post Act).
- Following this: margins, dydx(Act\_inception) at(England=(0 1)), calculates the marginal effect of the Act for both England and Scotland.
- These marginal effects are displayed in rows 5 and 6 of Table 2.6.1-2 (Labelled Difference).
- Finally: margins, dydx(Act\_inception) at(England=(0 1) contrast), calculates the difference between the two marginal effects, yielding the Difference-in-Differences (DiD) estimate. The contrast option is added to calculate this 'double' difference including the associated standard errors using the 'Delta method' (McFadden, 1974a, 1974b).
- This is presented in row 7 of Table 2.6.1-2 (labelled Difference in Diff (DiD))

This process is repeated for the probit models by altering the initial estimation from Xtlogit to Xtprobit.

As explained earlier, calculating predicted probabilities and marginal effects are essential for understanding the impact of predictors when direct interpretation of model

coefficients is not straightforward, particularly in models where the relationship between predictors and the outcome is non-linear, like those seen in logistic or probit regressions.

These predicted probabilities and marginal effects are computed by quantifying the change in the predicted probability of an outcome (becoming a new carer or non-carer) in response to a unit change (England or Scotland and Pre and Post act periods) in an independent variable, while holding other variables constant. In my models, as explained above, I am calculating the Average Marginal Effect, which calculates the marginal effect for each observation in the data and then averaged.

#### 2.5.6 Carer uptake interacted with employment status

Note that the model in Equation 2.5.4-1 has been extended to include 3-way interactions in Equation 2.5.6-1, such as an interaction between England, Post-Act and *lagged personal income* or *employment status*. This is to allow for the fact that the impact of the act may differ between people of different income groups and employment status. Gender was also considered but preliminary tests indicated the effect of the act did not differ between men and women.

# Equation 2.5.6-1: Probability to provide informal care interacted with employment status

$$Pr(Y_{i,t} = 1 | Z) = Pr(carer_{i,t} = 1 | carer_{i,t-1} = 0, Z)$$
  
=  $F(\beta_1 + \beta_2 C_{i,t} + \beta_3 A_{i,t} + \beta_4 A_{i,t} C_{i,t} + \beta_5 E_{i,t-1} + \beta_6 A_{i,t} E_{i,t-1} + \beta_7 C_{i,t} E_{i,t-1} + \beta_8 A_{i,t} C_{i,t} E_{i,t-1} + \gamma' Z + u_i)$ 

In this equation, E is a dummy variable taking a value of 1 if the individual was in paid employment in the previous period (t-1), and 0 if the individual was not in paid employment. E is replaced by I for the income interaction models.

Including employment status will alter the variables in the base model see Equation 2.5.4-1.  $\beta_2$ , would now correspond to the difference in the probability to transition into providing care between England and Scotland, but now only for those unemployed.  $\beta_3$  would correspond to the difference in the probability to transition into providing care for

those unemployed between the post-Act and pre-Act period but for the control group, Scotland.  $\beta_4$  now corresponds to the difference in probabilities for those unemployed in Post Act England, compared to the control group Scotland.  $\beta_5$  corresponds to the difference in transition for those employed in the previous period in Scotland before the act.  $\beta_6$  corresponds to this the cohort in Scotland after the act and  $\beta_7$  for the those in England. Whilst  $\beta_8$  is the main focus of the 3-way interaction investigation. This coefficient determines how much higher/lower the change in the probability to transition into care differs between England and the control group, Scotland for those in paid employment in the previous period (t-1).With regard to personal incomes the variables mentioned above will change to the impact of a unit increase in personal income (measured in 000's), instead of a binary outcome like those previously, regarding employment status. Those with no personal income will continue to be unemployed.

#### Equation 2.5.6-2: Difference in Difference estimator 3-way interaction - Employed

$$\widehat{D\iota D} = \left(\Pr(Y=1|C=1, A=1, E=1) - \Pr(Y=1|C=1, A=0, E=1)\right) - \left(\Pr(Y=1|C=0, A=1, E=1) - \Pr(Y=1|C=0, A=0, E=1)\right)$$

(please note subscripts have been removed for convenience) In contrast to Equation 2.5.5-1, Equation 2.5.6-2 calculates the difference in the predicted probability to transition into providing informal care for those who were employed in t-1, before and after the act was implemented in England, minus the difference in this probability before and after the Act in Scotland for those who were employed. Under PPA, this second difference is the counterfactual. The value for E is altered to 0 for those unemployed and becomes I for income.

As before I now adjust the margins command in stata to include *employment status (0 1)* or *personal income levels (25th and 75<sup>th</sup> percentile).* This extends the model in Equation 2.5.5-1 to Equation 2.5.6-2 In this paper for those who are employed I adopt the Average Marginal Effect approach:

- Initially: margins, Act\_inception, at(England = (0 1) L\_Employed = 1), calculates the predicted probability of Y=1 (newcarer = 1) both before and after the implementation of the Act, separately for Scotland and England for those that were employed in the previous period.
- These results are presented in the first four rows of Table 2.6.2-2 (labelled Pre & Post Act), where the columns include employed.
- Following this: margins, dydx(Act\_inception) at(England=(0 1) L\_Employed
   = 1), calculates the marginal effect of the Act for both England and Scotland for those that were employed in the previous period.
- These marginal effects are displayed in rows 5 and 6 of Table 2.6.2-2 (Labelled Difference), where the columns include employed.
- Finally: margins, dydx(Act\_inception) at(England=(0 1) L\_Employed = 1) contrast), calculates the difference between the two marginal effects, yielding the Difference-in-Differences (DiD) estimate. The contrast option is added to calculate this 'double' difference including the associated standard errors using the 'Delta method' (McFadden, 1974a, 1974b).
- This is presented in row 7 of Table 2.6.2-2 (labelled Difference in Diff (DiD)) where the columns include employed.

This process is repeated for those unemployed by altering L\_Employed = 1 to L\_Employed = 0. Personal income percentiles are inputted as the numerical value.

As explained earlier, calculating marginal effects are essential for understanding the impact of predictors when direct interpretation of model coefficients is not straightforward, particularly in models where the relationship between predictors and the outcome is non-linear, like those seen in logistic or probit regressions. However, I am now quantifying the change in the predicted probability of an outcome (becoming a new carer or non-carer) in response to a unit change (England or Scotland, Pre or Post act periods and Lagged - employed and unemployed status or lagged personal income levels – 25th and 75<sup>th</sup> percentile) in an independent variable, while holding other variables constant. I continue to calculate the Average Marginal Effect, which calculates the marginal effect for each observation in the data and then averaged. By controlling for employment status and income levels, the analysis allows for a clearer assessment of how

the relationship between key predictors and the outcome variable may vary across different socio-economic conditions. This approach enhances the robustness of the findings by accounting for these economic factors, thereby providing a more nuanced understanding of the underlying dynamics and how the act influences the uptake of care dependent on these circumstances.

#### 2.5.7 Carer retention – (DID) equations

#### Equation 2.5.7-1: Probability to become a new non-carer

$$\Pr(Y_{it} = 1|Z) = \Pr(carer_{i,t} = 0 | carer_{i,t-1} = 1, Z)$$

$$= F(\beta_{1} + \beta_{2}C_{i,t} + \beta_{3}A_{i,t} + \beta_{4}A_{i,t}C_{i,t} + \gamma'Z + u_{i})$$

Moving now to my second set of models,

Equation 2.5.7-1 present the carer retention model. The only difference with the previous model is that now,  $Y_{i,t} = 1$  if  $carer_{i,t-1} = 1$  but  $carer_{i,t} = 0$ , and  $Y_{i,t} = 0$  otherwise. That is, the outcome variable takes value 1 if a person stops providing care in time *t* having been a carer in time *t*-1. For this model, individuals who never provided care during the survey were exclude. Also, individuals were removed from the sample the wave after they dropped their caring activity. The models include the same variables as those included in Equation 2.5.4-1, which are those presented in Table 2.5.9-1. This model is expanded to include the 3-way interactions (see Equation 2.5.6-1). The DiD estimates are again obtained using Equation 2.5.5-1 and Equation 2.5.6-2 as is done for the carer-uptake model in Equation 2.5.4-1.

#### 2.5.8 Policy timeline and the natural experiment

Within the United Kingdom, England and Scotland are independent to pursue their own care policies. Education, Health and Justice are other devolved policy areas. The English Care Act 2014 was implemented in England, in April 2015 having first been brought to parliament in May 2013, with its ascension to royal assent in May 2014. An equivalent policy was not implemented in Scotland until the 1<sup>st</sup> April 2018, where "The Carers (Scotland) Act 2016", (Henceforth "Scottish Act") provided identical support for carers in the context of Scotland. (There was a similar delay from it receiving assent to it being implemented due to the structural changes required.) The time between England's inclusion of their Act and the Scottish Act is 3 years. During these 3 years those in Scotland were not impacted by a care Act like their counterparts in England. This natural experiment has presented an ideal opportunity to test the impact of the Act by using a Difference-in-Differences (DiD) methodology to analyse the impact on the uptake and retention of informal carers.

Scotland was chosen as the control for England, for several reasons. At the time Wales was also experiencing a similar development to that of England with regard to a law covering carers, theirs came into effect on the 6<sup>th</sup> April 2016. Northern Ireland (NI) being the other member of the United Kingdom has several factors that make it an unsuitable control. There are very clear differences in cultures between that of the other members of the United Kingdom. The political landscape in NI is more challenging given the historical conflicts. NI is also the least similar member of the UK economically. NI has the smallest population of the UK, followed by Wales, Scotland then England. Choosing Scotland provides the largest possible comparative sample. But most importantly it implemented a much shallower and unfunded Care Act in 2002. However, it gave carers access to an assessment but did not put a duty on local authorities to meet the identified needs of the carer/s.

#### 2.5.9 Variables

Lagged variables have been used to account for an individual's situation prior to making the transition into caregiving. This approach allows for the use of regressions to identify the factors that influence both the initiation and continuation of caregiving. These variables will be prefixed with "L\_" in the following sections.

Variable name	Variable definition	Values
Newcarer	Individual has become a new carer in time t having not been a	0 Not caring
	carer in time t-1.	1 New carer
Newnoncarer	Individual has become a new non carer in time t having been a	0 Carer
	carer in time t-1.	1 New non carer
Age	Age in years of individual	18 to 104
Male	Individual self identifies as male	0 Female, 1 Male
Ethnicity: White	Individual self identifies as white	0 No, 1 Yes
Ethnicity: Mixed	Individual self identifies as mixed	0 No, 1 Yes
Ethnicity: Asian	Individual self identifies as Asian	0 No, 1 Yes
Ethnicity: Black	Individual self identifies as Black	0 No, 1 Yes
L_Illhealth	Individual has a long-term disability	0 No, 1 Yes
L_Employed	Individual is in paid employment	0 No, 1 Yes
L_Personal income £	Monthly Personal income in £1000's	0 to 27.587
(Each individual has a unique id in		(Absolute incomes
survey)		are 0 to 27,587)
L_Residual income £	Monthly HH income minus the personal income of individual	0 to 89.486
(Each household has a unique id	responding to survey in £1000's	(Absolute incomes
in the survey that is shared to all adults in that household)	(Monthly income of the household – L_Personal Income)	are 0 to 89,486)
L_Haschildren	Individual is responsible for a child under 16 years old.	0 No
	Includes: parents, guardians and carers	1 Yes
L_No_of_adults_in_HH	Number of adults over 16 years old in the household	0 to 12
L_No_of_children_in_HH	Number of children under16 years old in the household	0 to 9
L_Couple	Individual is in a couple/relationship	0 No, 1 yes
L_Degreelevel	Individual has a degree level of education	0 No, 1 yes
England	Individual is living in England, base is Scotland	0 Scotland
		1 England
Act inception	Date of Act inception 1 <sup>st</sup> April 2015	0 Before
		1 On or after this
		date

#### **Table 2.5.9-1: Variable Descriptions**

#### 2.5.10 Carer uptake - whole sample

Variable	Mean	Standard deviation
New carer in time t	0.061	0.239
Age	48.332	17.812
Male	0.476	0.499
Ethnicity: White	0.824	0.381
Ethnicity: Mixed	0.018	0.132
Ethnicity: Asian	0.104	0.305
Ethnicity: Black	0.046	0.210
Lagged: Has a disability or long-term illness	0.328	0.469
Lagged: In paid employment	0.623	0.485
Lagged: Gross personal income	1795.01	1606.05
Lagged: Residual income	3805.94	2756.44
Lagged: Responsible for a child under 16	0.239	0.426
Lagged: Num of adults over 16 in household	2.261	1.034
Lagged: Num of children under 16 in household	0.629	0.996
Lagged: In a couple	0.661	0.473
Lagged: Degree level education	0.268	0.443
Observations	165427	

#### Table 2.5.10-1: Descriptive statistics: Uptake full sample

The summary statistics in Table 2.5.10-1, refer to the combined sample of England and Scotland reveal several pertinent points relevant to this study. Within the panel, 6% of the sample became new carers. The mean age of the sample is around 48 years old which is representative of the UK, with 33% reporting a long-term illness or disability. While these illnesses do not necessarily require carers or time off work, this relatively high figure should be interpreted with caution. The survey only inquires whether individuals have a long-term illness or disability, without further details on the severity or type of illness, which could range from cancer to eczema. Males constitute 48% of the sample, and the majority self-identify as white British. On average, households have fewer than one child. Households average two adults, though statistics show 2.3 adults over 16 years old, likely reflecting older children. Additionally, 66% of the sample are in a couple, and 27% have a degree, a figure expected to increase with newer samples due to the rise in university attendance. Regarding employment, 62% of the sample are in paid employment. The mean monthly gross personal income is £1795.

In pursuing the difference in difference model, we must determine if the sample of the control and treatment are similar. Table 2.5.10-2 shows summary statistics, split for England and Scotland, together and pre and post act periods. When comparing England and Scotland, these geographic neighbours exhibit many similarities, reinforcing their

suitability as control and treatment groups in a difference-in-difference model. For instance, the percentage of new carers and the proportion of the sample post-legislation implementation are very similar in both countries. The sample in Scotland is older by an average of two years, a difference confirmed by a t-test, though this difference is considered negligible for comparative purposes. A significant difference would be a decade, which would notably impact the likelihood of providing or receiving care.

The gender distribution is similar, with both countries having more females than males. A major disparity in gender proportions would have undermined their comparability. However, the ethnic compositions differ substantially, with Scotland being predominantly white and less ethnically diverse. Different cultures may have varying propensities for multi-generational households and caregiving practices, however there is no evidence this is true in the UK. The proportions of individuals with ill health and those in employment are comparable, though t-test results indicate a significant difference, these differences remain relatively minor. Personal incomes are similar, but there appears to be a difference in residual incomes, possibly linked to the larger number of adults in households in England. Overall, despite t-tests indicating some significant differences between England and Scotland, these differences are minor and do not substantially affect the likelihood of providing care, affirming their suitability for comparison in this context.

It is also valuable to determine if there are any significant differences that may alter likelihood to care between England and Scotland in the period prior and after the Act was introduced to further determine if these are suitable comparison. Table 2.5.10-2 presents these sample characteristics across England and Scotland as a whole and during the pre and post-Act periods. England is represented in orange, Scotland in blue, and t-tests are shown in white.

The means for the variable newcarer are similar across both periods, with only a minor difference at the 10% significance level in the post-Act period, Scotland decrease of 0.1. Importantly there is no significant difference in the newcarer variable across both countries in the pre-act period.

In both periods, there is a higher proportion of females, though the differences are not statistically significant. Ethnic compositions are consistent across periods and countries,

though t-tests reveal statistically significant differences. England shows greater ethnic diversity, with the proportion of White individuals decreasing between periods, whereas in Scotland this proportion increases. Disability rates remain above 30% in both periods, with a statistically 3% higher rate in Scotland during the pre-Act period at the 1% level.

Variables	Eng	Sac	T Test	Eng	Sac	Dro	Eng	Sac	Doct
variables	Eng	500	1-Test	Dre	SC0 Pre	T-Test	Post	Post	POSI T-Test
	Mean	Mean	b	Mean	Mean	b	Mean	Mean	b
Newcarer	0.06	0.06	0.00	0.07	0.07	0.00	0.05	0.04	-0.01*
Age	48.13	50.23	2.09***	48.19	50.03	1.84***	48.01	50.71	2.71***
Male	0.48	0.47	-0.01**	0.47	0.47	-0.01	0.48	0.47	-0.01
White	0.81	0.98	$0.17^{***}$	0.82	0.98	0.16***	0.78	0.98	$0.20^{***}$
Mixed race	0.02	0.01	-0.01***	0.02	0.01	-0.01***	0.02	0.01	-0.01***
Asian	0.11	0.01	-0.10***	0.11	0.01	-0.09***	0.13	0.01	-0.12***
Black	0.05	0.00	-0.05***	0.05	0.00	-0.05***	0.05	0.00	-0.05***
L_IIIhealth	0.33	0.35	$0.02^{***}$	0.33	0.36	0.03***	0.31	0.31	-0.00
L_Employed	0.62	0.62	-0.01*	0.61	0.61	-0.00	0.65	0.63	-0.02**
L_Persincome	1794.9	1796.1	1.19	1729.7	1733.7	4.05	1944.1	1947.5	3.37
L_Residualincome	3825.3	3622.3	202.93**	3639.8	3494.6	145.25**	4249.9	3932.8	317.10**
L_Haschildren	0.24	0.21	-0.04***	0.25	0.21	-0.03***	0.23	0.19	-0.04***
L_No_of_adults_in_HH	2.28	2.10	-0.18***	2.25	2.10	-0.15***	2.35	2.10	-0.25***
L_No_of_children_in_	0.64	0.54	-0.09***	0.63	0.55	-0.09***	0.65	0.54	-0.11***
L_Couple	0.66	0.65	-0.01***	0.66	0.65	-0.01**	0.66	0.64	-0.02**
L_Degreelevel	0.27	0.25	-0.02***	0.26	0.24	-0.02***	0.30	0.28	-0.03***
Ν	14963	15788	165427	10415	11185	115340	45484	4603	50087

Table 2.5.10-2: Descriptive statistics: Uptake - Whole , Pre and Post act

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Employment levels are similar pre-Act, but post-Act, the sample in England exhibits a higher mean of employment. Personal income is comparable across both periods and countries, though residual income is consistently but marginally higher in England. England also has a higher proportion of parents in the sample when compared to Scotland. Household composition in terms of adults and children is higher in England during both periods. The number of adults in households is greater in England, though the difference between periods is minimal. There is a significant difference in the proportion of couples across the two countries, with England showing a consistently but marginally higher figure, while those in Scotland are less likely to be in a couple. England

also has a higher share of individuals with a degree in both periods, a difference that holds across countries ranging from 2 to 3 percent.

Overall, the table does not reveal any factors that would challenge the suitability of Scotland as a control group, as the differences between the countries remain largely consistent across the Act periods.

In conclusion before the Act in comparison to Scotland, those interviewed in England were younger, more ethnically diverse, healthier, households had higher incomes, more parents of under 16's, larger households in terms of adults and children, more likely to be in a couple and better educated. In the post act period however, a few things changed. They were more likely to be a carer, no longer had poorer health and were more likely to be employed compared to Scotland.

This section has identified some of the differences between England and Scotland both as a whole and across the periods of the Act. Whilst there are some differences as determined by the t-tests, these are not to a degree that would suggest Scotland is not a suitable control. Where there are differences, the majority of these are consistent across time periods and the evidence suggests these differences are insignificant in the process of this study. I shall now discuss the carer retention sample. For the retention model our sample only includes carers and new noncarers, who were caring in time t - 1 but are no longer in time t. For example, if someone is a carer in wave 1 and wave 2 but stops providing care in wave 3, they will be dropped at wave 4.

	Whole Sample						
	Mean	Std Dev					
No longer providing care	0.41	0.49					
Act_inception	0.22	0.42					
England	0.91	0.29					
Age	53.39	16.17					
Male	0.41	0.49					
Ethnicity: White	0.86	0.35					
Ethnicity: Mixed	0.01	0.12					
Ethnicity: Asian	0.09	0.28					
Ethnicity: Black	0.03	0.18					
Lagged: Has a disability or long-term illness	0.41	0.49					
Lagged: In paid employment	0.54	0.50					
Lagged: Gross personal income £	1630.96	1496.79					
Lagged: Residual income (HH inc minus L_persincome) $\pounds$	1877.16	2029.54					
Lagged: Responsible for a child under 16	0.19	0.39					
Lagged: Num of adults over 16 in household	2.29	1.03					
Lagged: Num of children under 16 in household	0.50	0.95					
Lagged: In a couple	0.71	0.45					
Lagged: Degree level education	0.22	0.41					
29,623 observations clustered to 13,037 unique individuals							

Table 2.5.11-1: Descriptive statistics: Retention full sample

Table 2.5.11-1 displays descriptive statistics for the retention sample. During the survey, 41 % of carers ceased their caregiving role, with 22 % of these individuals having become non-carers after the Act was introduced in 2014. The majority of the sample, 91%, are based in England. The average age of a carer is 53 years, and most carers are female. Additionally, a significant proportion of the sample identifies as white. A significant percentage (41) of individuals reported having a disability, and most were employed at the time of the survey. The average gross personal income is just over £1,630 per pay period, while household incomes average nearly £1,900 per pay period. Furthermore, 20% of carers are responsible for a child, which combines childcare and caregiving responsibilities. On average, there are nearly 2.3 adults per household, with the average number of children being 0.5. Additionally, 71% of respondents are in a couple/ relationship. Regarding educational attainment, 22% of the carers hold a degree. Among

new non-carers, 22% were employed in the previous period, compared to 54% of carers who were employed during the same timeframe. Personal incomes for both groups are comparable.

When comparing the two samples of uptake and retention several key differences emerge. The retention sample is older and has a higher proportion of females. Additionally, this group exhibits higher rates of disability and a lower percentage of individuals in employment. Both personal and household incomes are lower in the retention sample. Furthermore, there is a reduced proportion of individuals with children in this group, although the number of adults in households remains similar across both samples. The retention sample also has fewer children per household and a greater likelihood of being in a couple. Finally, the level of degree education is lower among the retention sample compared to the uptake sample.

	Eng	Sco	T-Test	Eng	Sco	Pre	Eng	Sco	Post
	Ū			Pre	Pre	T-Test	Post	Post	T-Test
Variables	Mean	Mean	В	Mean	Mean	В	Mean	Mean	В
Newnoncarer	0.409	0.447	0.038***	0.385	0.415	0.029***	0.490	0.583	0.093***
Age	53.345	53.860	0.516*	53.302	53.738	0.436	53.491	54.383	0.892
Male	0.407	0.404	-0.003	0.405	0.397	-0.008	0.414	0.434	0.020
White	0.847	0.975	0.128***	0.852	0.974	0.123***	0.829	0.977	0.148***
Mixed race	0.015	0.005	-0.010***	0.015	0.005	-0.009****	0.014	0.002	-0.012***
Asian	0.097	0.015	-0.082***	0.092	0.015	-0.077***	0.115	0.013	-0.102***
Black	0.035	0.002	-0.034***	0.036	0.001	-0.035***	0.034	0.006	-0.029***
L_IIIhealth	0.403	0.424	0.021**	0.408	0.440	0.032***	0.388	0.357	-0.031
L_Employed	0.539	0.561	0.022**	0.537	0.559	0.023**	0.547	0.568	0.021
L_Persincome	1630.06	1639.38	9.32	1588.36	1588.49	0.13	1772.54	1856.23	83.69
L_Residualincome	1882.48	1826.13	-56.34	1807.27	1755.61	-51.65	2139.49	2126.68	-12.81
L_Haschildren	0.191	0.170	-0.020***	0.194	0.185	-0.009	0.179	0.107	-0.072***
L_No_of_adults_in_HH	2.308	2.159	-0.149***	2.297	2.138	-0.159***	2.346	2.250	-0.096**
L_No_of_children_in_HH	0.512	0.411	-0.102***	0.511	0.439	-0.071***	0.519	0.289	-0.229***
L_Couple	0.713	0.683	-0.031***	0.715	0.678	-0.036***	0.709	0.701	-0.008
L_Degreelevel	0.216	0.208	-0.008	0.207	0.208	0.002	0.247	0.207	-0.040**
L_Employed_newnoncarers	0.547	0.567	0.020	0.541	0.565	0.024	0.562	0.574	0.012
L_Employed_carers	0.534	0.556	0.022*	0.534	0.555	0.021	0.532	0.559	0.027
L_Persinc_newnoncarers	1632.98	1613.17	-19.81	1578.11	1520.74	-57.36	1780.60	1893.44	112.84
L_Persinc_carers	1628.05	1660.54	32.49	1594.80	1636.49	41.69	1764.81	1804.27	39.46
N	26824	2799	29623	20751	2267	23018	6073	532	6605

Table 2.5.11-2: Descriptive statistics: Retention – Whole , Pre and Post act

 $\overline{p < 0.10, ** p < 0.05, *** p < 0.01}$ 

A comparison of the sample split by country may allude to any significant differences in the sample and its impact on quitting care. See Table 2.5.11-2. Approximately 41% of individuals within the sample transition from carer to non-carer status, with this figure being similar across both countries. Scotland consistently has a higher proportion of new noncarers across all periods. Although this is not ideal this is consistent, which indicates retention is higher in England, which further increases in the post act period as may be expected. While the proportion of the sample post-legislation is comparable, it is slightly smaller in Scotland, due to differences in attitudes and the UKHLS sampling methodology.

Carers are of similar age in both countries, with only a small difference of six months. The propensity for ill health among carers is similar, though 2% higher in Scotland, aligning with previous research suggesting that those with lower opportunity costs are more likely to provide informal care. Households headed by couples are more common in England (71%) compared to Scotland (68%). There is no significant difference in the proportion of individuals with degrees between the two countries, despite Scotland's more favourable education system for domestic students. Households in England tend to have more adults (.15) and children (0.1). The retention sample closely mirrors the uptake sample in terms of ethnicity, with significantly more white individuals and less ethnic diversity in Scotland.

There is no significant difference in personal and residual income between the two countries. However, despite similar earnings for carers and non-carers, a higher proportion of carers are employed in Scotland than in England. The mean monthly personal income for caregivers is £1639. Notably, 60% of the sample are female, consistent with previous evidence that females are more likely to provide informal care. The sample exhibits an increased average age by nearly six years compared to the previous dataset used in modelling the uptake of informal care.

#### 2.5.12 Further investigation of parallel paths

To evaluate whether the data exhibits parallel path assumptions, a key assumption when using (DID) econometric methodologies. I shall plot the predictions in both countries of the likelihood to be a new carer and new non carer across time. The parallel path assumption is easily stated as the difference between the control and treatment group is constant, and the trend is similar prior to the treatment. This would for example result in the trends between Scotland and England being similar over time. We would expect the trend in being a new carer to be similar in the two countries given their significant correlation. They share a government, language, legal process and are facing similar demographic challenges. It is also important to establish that these predictions are made including the variables I have included in the model.

#### 2.5.13 Prediction to be a New carer

I have presented the predicted margins for being a new carer prior to the introduction of the Act in 2015. This is first illustrated in Figure 2.5.13-1, which depicts the trend for new carers up to the enactment of the legislation, and in Figure 2.5.13-2, which illustrates the trend for new carers one year prior to the Act (t-1). The first figure demonstrates that, prior to the Act, there were notable similarities in the trends of new carers across England (in red) and Scotland (in blue). Starting from the sample in 2010, a consistent decline is observed leading to the implementation of the Act. The largest difference between the two countries is 0.05 percent at the beginning of the period. However, the results indicate that there is no significant difference between the two countries that would preclude Scotland from being considered suitable control. A significant difference is evident between 2014 and 2015, which is why the second figure has been included to plot the predictions up to 2014. Once again, the plots suggest similarities in the trends between the two countries.



Figure 2.5.13-1: Prediction of new carer, up to the ACT

Figure 2.5.13-2: Prediction of new carer, ACT, T-1


#### 2.5.14 Prediction to be a New non-carers

I have presented the predicted margins for being a new non-carer and for carer retention prior to the introduction of the Act in 2015. This is first illustrated in Figure 2.5.14-1, which depicts carer retention up to the enactment of the legislation, and in Figure 2.5.14-2, which illustrates carer retention one year prior to the Act (t-1). The first figure indicates that the predicted margins are lower throughout England, suggesting that carer retention is higher in that country. Notably, this trend remains consistent, with the two figures converging in 2014. In the second figure, a similar trend is observed across both countries, with convergence occurring in 2013.



Figure 2.5.14-1: Prediction of new non carer, up to the Act

Figure 2.5.14-2: Prediction of new non carer, ACT, T-1



The results from both geographical representations—predicting the likelihood of becoming a carer and the likelihood of ceasing to be one—indicate similar trends and propensities in both countries throughout the survey periods. To further investigate whether differences exist between the two countries over time, an additional joint trends

test was conducted, as detailed in Table 2.5.14-1. The F-test is an informal test comparing the time periods for England and Scotland, this indicates that we cannot reject the null hypothesis of no difference at the 5% significance level; in 10 out of 12 cases, the null hypothesis also cannot be rejected at the 1% level. For the younger sample, the parallel trend assumption holds across all models and significance levels. In the case of the entire sample, the null hypothesis cannot be rejected at the 1% level, with only one instance rejected at the 5% level. Regarding the older sample, the null hypothesis cannot be rejected for the new carer group. However, for the new non-carer group within the retention model, I find sufficient evidence to reject the null hypothesis at the 1% level.

Sample	Carer type	Year	Testparm chi	Prob > chi2
Full	Newcarer	2015	11.85	0.0369*
Full	Newcarer	2014	9.15	0.0575*
Full	New Non-carer	2015	10.43	0.0640*
Full	New Non-carer	2014	7.08	0.1318
Under 50	Newcarer	2015	3.99	0.5508
Under 50	Newcarer	2014	0.23	0.9938
Under 50	New Non-carer	2015	2.00	0.8494
Under 50	New Non-carer	2014	0.47	0.9767
50 and over	Newcarer	2015	16.03	0.0068*
50 and over	Newcarer	2014	16.70	0.0022*
50 and over	New Non-carer	2015	14.27	0.0140*
50 and over	New Non-carer	2014	10.95	0.0271*

Table 2.5.14-1: Joint tests for parallel path (Year 2015 in Bold. Newcarer in orange)

Overall, I have compared England and Scotland across the demographics and variables included in the model. The two countries exhibit numerous similarities, with differences that are subtle in nature. While the predictions are not identical throughout, both countries demonstrate a similar trend. The joint tests further indicate that, depending on the confidence level, a significant proportion of the samples do not provide evidence to reject the assumption that these two countries are suitable for comparison.

#### 2.5.15 Data consideration

The data utilised in this study is sourced from the UK Household Longitudinal Study (UKHLS). This survey encompasses a broad range of topics, enhancing its applicability across diverse genres, subjects, and research domains. However, due to the survey's

universal scope, some questions may lack the depth required for the purposes of this paper. Additional questions concerning the care recipients and detailed information about the type of care, hours of care provided, other caregivers involved, and similar aspects would have significantly contributed to this research. Moreover, further details on the initial instance of care, such as the cause of the care needed, whether it was due to a sudden episode or an anticipated requirement, and any previous use of formal care arrangements, would have been valuable. With this knowledge the discussion around carer retention and uptake would have been more thorough. However, there is still value in determining the uptake of and retention of care in the pre act and post act period. Policy evaluation is not new, significant policies have been evaluated using the (DID) methodology these include Gaynor, Moreno-Serra and Propper (2013). They evaluated the impact of NHS competition reforms on clinical outcomes and productivity and expenditure. Schmitt (2017) analysed hospital mergers and their impacts on costs. Evaluating policies is critical to understand the real-world impact of these policies and to inform alternatives or revisions.

There are also significant differences in the number of individuals in each sample between England and Scotland. The survey has been constructed to be a representative sample from the United Kingdom, given the proportion of the populations are unequal this is going to be reflected in any longitudinal survey. It would have been beneficial for each country to have a similar sample to increase precision and provide a better representation of the true sample and more robust results.

#### 2.5.16 Informing the non-econometric audience

For the non-econometric audience in the subsequent results section the significance levels refers to 10, 5 and 1 % levels. These mean A significance level of 10% (often denoted as  $\mathbf{p} = 0.10$ ) indicates that there is a 10% chance of observing the results, or something more extreme, if the null hypothesis is true. In other words, it reflects a 10% probability of making a **Type I error**, which occurs when we incorrectly reject a true null hypothesis.

## 2.6 Results

All of the models employ the stata prefix XT, with the RE (random effects) suffix. This ensures the models account for the panel structure of our data. Logit models will be presented first, these are in yellow followed by **Probit** models in Orange. All of the models have been presented in a structure that includes: the "whole sample" incorporating all individuals. This will then be divided into an "older" and "younger" sample. The older sample will incorporate those individuals 50 years old and above. The younger sample will incorporate those under the age of 50. The division of the sample around 50 years of age is reflective of the significant life changes that typically occur beyond this point. As individuals approach 50, they experience a range of dynamic factors, including their own aging process and the aging of their loved ones. Additionally, the presence of grandchildren may further influence their willingness to provide care. At this stage, individuals often begin to reassess their attitudes towards caregiving, recognising the increasing likelihood of needing or providing care. This shift in attitude is often driven by pre-emptive expectations regarding the demands of care, making individuals more inclined to provide support to others. At the same time the cost of providing care is less severe as they are likely to be approaching retirement, seeking a slower pace of life and may already be financially secure. The willingness to continue to provide care may also be different for those after 50 years of age because of the reasons discussed. The regression results will be presented initially, followed by predicted probabilities and marginal effects based on the estimates derived from these regressions. The regressions presented will initially interact the England and Post Act variables (England Post-Act) to establish the impact of the Act in England compared to Scotland. These will by supplemented with additional variables to evaluate 3-way interactions, first with employment status and then personal income. This will provide some insights into how the Act may impact carer uptake and retention based on employment status and personal incomes.

#### 2.6.1 Carer Uptake - propensity to provide care

The focus of the first model is the 2-way interaction variable "England Post-Act." Table 2.6.1-1 reports results for the models employing Equation 2.5.4-1. The England Post-Act variable is the effect of the act in England. For the whole sample this is positive at the 10% level with the younger sample the effect of this grows in magnitude and significance to the 5% level. These are corroborated in Table 2.6.1-2 where these predicted marginal effects suggest the likelihood to become a carer increases in England by 1 % and 0.9% at the 10% level for the whole sample across both logit and probit models. Across the younger sample the (DID) suggests this increases to 1.7% and 1.6% at the 5% level. The country differences above the (DID) estimates also suggest after the act was introduced there were real differences across England and Scotland in reference to carer uptake. The results in Table 2.6.1-1 further indicate men are less likely to become carers which corroborates the findings of Carmichael, Charles and Hulme (2010). The wave variable indicates across all models a decline in the likelihood to provide care. Ethnicity doesn't appear to play a significant role in carer uptake but further analysis would be required to corroborate this remark. Disability appears to increase younger people to care with the inverse for older people, who subsequently are likely to require support. This may be linked to opportunity cost.

New carer	Logit	Prohit	Logit	Prohit	Logit	Prohit
new carer	All	All	50 & Over	50 & Over	Under 50	Under 50
Post-Act	0.060	0.035	0.197*	0.098*	- 0.147	- 0.063
	(0.095)	(0.046)	(0.119)	(0.058)	(0.153)	(0.072)
England	- 0.038	- 0.019	0.027	0.013	- 0.143**	- 0.070**
	(0.047)	(0.024)	(0.058)	(0.029)	(0.071)	(0.035)
England Post-Act	0.164*	0.077*	0.041	0.017	0.352**	0.166**
(England # Post Act)	(0.092)	(0.044)	(0.115)	(0.056)	(0.148)	(0.070)
Employed	- 0.211***	- 0.108***	- 0.087**	- 0.043*	- 0.256***	- 0.131***
	(0.033)	(0.016)	(0.044)	(0.022)	(0.047)	(0.023)
Age	0.080***	0.040***	0.023	0.013	0.002	0.001
	(0.005)	(0.003)	(0.021)	(0.010)	(0.020)	(0.010)
Age # Age	- 0.001***	- 0.000***	- 0.000	- 0.000*	0.000*	0.000*
(Age Squared)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	- 0.297***	- 0.148***	- 0.205***	- 0.102***	- 0.396***	- 0.193***
	(0.029)	(0.014)	(0.035)	(0.018)	(0.044)	(0.022)
Wave	- 0.090***	- 0.044***	- 0.132***	- 0.064***	- 0.080***	- 0.039***
	(0.012)	(0.006)	(0.015)	(0.007)	(0.017)	(0.008)
Ethnicity: White	- 0.125	- 0.063	- 0.102	- 0.049	- 0.185	- 0.091
	(0.133)	(0.067)	(0.190)	(0.096)	(0.173)	(0.086)
Ethnicity: Mixed	- 0.098	- 0.053	- 0.149	- 0.072	- 0.148	- 0.077
	(0.164)	(0.082)	(0.257)	(0.128)	(0.207)	(0.102)
Ethnicity: Asian	- 0.157	- 0.078	- 0.359*	- 0.178*	- 0.008	- 0.004
	(0.138)	(0.069)	(0.202)	(0.102)	(0.177)	(0.087)
Ethnicity: Black	- 0.203	- 0.101	- 0.179	- 0.088	- 0.263	- 0.127
	(0.145)	(0.072)	(0.209)	(0.105)	(0.187)	
Disabled	0.028	0.016	- 0.066**	- 0.033**	$0.208^{***}$	$0.105^{***}$
Development la serve e	(0.027)	(0.013)		(0.016)	(0.042)	(0.021)
Personal Income	-0.000	(0.000)	-0.019	- 0.009	0.011	0.007
Decidual in come		(0.006)	(0.015)	(0.008)	(0.017)	(0.008)
Residual income	$-0.053^{+++}$	-0.026	-0.027	-0.013	$-0.071^{-0.0}$	$-0.034^{-0.05}$
Depent (Guardian (Coror	0.120***	0.004	0.220***	0.110***		
Parent/Guardian/Carer	$-0.120^{-0.1}$	$-0.060^{+++}$	-0.238	-0.118	$-0.089^{\circ}$	$-0.044^{\circ}$
Adults	0.158***	0.020***	0.067***	0.033	0.136***	0.023
Adults	(0.130)	(0.000)	(0.007)	(0.033)	(0.130)	(0.000
Children	0.001	- 0.000	- 0 114***	- 0.056***	0.075***	0.036***
Gimaren	(0.001)	(0,008)	(0.037)	(0.018)	(0.019)	(0,009)
Couple	0 140***	0.066***	0 434***	0.215***	- 0 139***	- 0 070***
Soupro	(0.031)	(0.015)	(0.046)	(0.023)	(0.047)	(0.023)
Degree	- 0.198***	- 0.099***	0.089**	0.045**	- 0.380***	- 0.183***
-0	(0.032)	(0.016)	(0.042)	(0.021)	(0.046)	(0.023)
Constant	- 4.492***	- 2.404***	- 2.559***	- 1.490***	- 3.034***	- 1.668***
	(0.219)	(0.110)	(0.771)	(0.375)	(0.430)	(0.211)
Observations	165427	165427	73355	73355	92072	92072

Table 2.6.1-1: Carer uptake: Two-way interaction - Regressions

Residual income and being responsible for a child as a (Parent, Carer or Guardian) both are negatively associated with providing care, these refer to wealth effect and time constraints. The number of adults in a household is positively correlated with caring. There are contrasting results for children, couple and degree. The number of children decreases the likelihood to be a carer in the older sample, whilst this increases in the younger sample. Being in a couple increases uptake generally but decreases in the younger sample. Having a degree and a subsequent higher opportunity cost decreases the uptake in the whole and younger sample. But increases uptake in the older sample this is likely correlated to those getting older around you.

Marginal Effects											
Category	Logit	Probit	Logit	Probit	Logit	Probit					
	All	All	50 & Over	50 & Over	Under 50	Under 50					
Scotland	0.069***	0.069***	0.073***	0.073***	0.062***	0.061***					
Pre Act	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)					
Scotland	0.072***	0.073***	0.087***	0.087***	0.055***	0.055***					
Post Act	(0.005)	(0.005)	(0.008)	(0.008)	(0.006)	(0.006)					
England	0.067***	0.067***	0 075***	0.075***	0.055***	0 055***					

0.075\*\*\*

(0.002)

0.092\*\*\*

(0.004)

0.014

(0.009)

0.017\*\*\*

(0.005)

0.004

(0.008)

73355

0.075\*\*\*

(0.002)

0.092\*\*\*

(0.004)

0.014\*

(0.008)

0.016\*\*\*

(0.004)

0.003

(0.008)

73355

0.055\*\*\*

(0.002)

0.065\*\*\*

(0.003)

- 0.007

(0.007)

0.010\*\*\*

(0.003)

0.017\*\*

(0.007)

92072

0.055\*\*\*

(0.002)

0.065\*\*\*

(0.003)

- 0.006

(0.007)

0.010\*\*\*

(0.003)

0.016\*\*

(0.007)

92072

Table 2.6.1-2: Carer uptake:	Two-way interaction -	Predicted	Probabilities	and
Marginal Effects				

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

#### 2.6.2 Carer uptake - employment status

0.067\*\*\*

(0.002)

0.080\*\*\*

(0.003)

0.004

(0.006)

0.014\*\*\*

(0.003)

0.010\*

(0.006)

165427

Pre Act

England

Post Act

Scotland

Difference

England

Difference

**Difference in** 

Diff (DID)

Observations

0.067\*\*\*

(0.002)

0.080\*\*\*

(0.003)

0.004

(0.005)

0.013\*\*\*

(0.003)

0.009\*

(0.005)

165427

The next models to be presented interact the impact of the act with employment status. This has been performed to evaluate if an important element of the act, in supporting people to live a normal life (employment) alongside themselves providing informal care. Employment was one of the major elements. This combats the income effect of providing informal care but also in keeping contact with the labour market. The regressions have been provided in Table 2.6.2-1, marginal effects in Table 2.6.2-2 and Table 2.10.1-1.

Negi essions						
New Carer	Logit	Probit	Logit	Probit	Logit	Probit
New Garer	All	All	50 & Over	50 & Over	Under 50	Under 50
Post-act	0.219	0.111	0.275*	0.139*	- 0.002	- 0.005
	(0.138)	(0.068)	(0.150)	(0.073)	(0.314)	(0.154)
England	0.041	0.022	0.064	0.034	- 0.147	- 0.076
	(0.073)	(0.037)	(0.077)	(0.038)	(0.143)	(0.072)
England Post-Act	0.026	0.008	- 0.043	- 0.027	0.287	0.145
(England # Post Act)	(0.140)	(0.069)	(0.151)	(0.073)	(0.318)	(0.156)
Employed	- 0.073	- 0.037	- 0.006	0.003	- 0.234	- 0.126
	(0.091)	(0.046)	(0.113)	(0.057)	(0.157)	(0.079)
Post- act # Employed	- 0.283	- 0.133	- 0.191	- 0.100	- 0.182	- 0.071
	(0.178)	(0.087)	(0.224)	(0.109)	(0.348)	(0.169)
England # Employed	- 0.138	- 0.071	- 0.089	- 0.050	0.007	0.008
	(0.093)	(0.047)	(0.116)	(0.058)	(0.162)	(0.081)
Post- act # England #	0.246	0.120	0.205	0.107	0.072	0.022
Employed (3 way interaction)	(0.186)	(0.091)	(0.235)	(0.114)	(0.359)	(0.174)
Age	0.080***	0.040***	0.023	0.013	0.002	0.001
	(0.005)	(0.003)	(0.021)	(0.010)	(0.020)	(0.010)
Age # Age	- 0.001***	- 0.000***	- 0.000*	- 0.000*	0.000*	0.000*
(Age Squared)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	- 0.298***	- 0.148***	- 0.205***	- 0.103***	- 0.395***	- 0.193***
	(0.029)	(0.014)	(0.035)	(0.018)	(0.044)	(0.022)
Wave	- 0.090***	- 0.044***	- 0.132***	- 0.064***	- 0.081***	- 0.040***
	(0.012)	(0.006)	(0.015)	(0.007)	(0.016)	(0.008)
Ethnicity: White	- 0.125	- 0.063	- 0.102	- 0.049	- 0.186	- 0.092
	(0.133)	(0.067)	(0.190)	(0.096)	(0.173)	(0.085)
Ethnicity: Mixed	- 0.099	- 0.053	- 0.149	- 0.072	- 0.149	- 0.077
	(0.165)	(0.082)	(0.257)	(0.128)	(0.207)	(0.101)
Ethnicity: Asian	- 0.157	- 0.078	- 0.359*	- 0.178*	- 0.010	- 0.005
	(0.138)	(0.069)	(0.202)	(0.102)	(0.177)	(0.087)
Ethnicity: Black	- 0.203	- 0.101	- 0.179	- 0.088	- 0.263	- 0.127
	(0.145)	(0.072)	(0.209)	(0.105)	(0.187)	(0.092)
Disabled	0.029	0.016	- 0.066**	- 0.033**	0.208***	0.104***
	(0.027)	(0.013)	(0.032)	(0.016)	(0.042)	(0.021)
Income	- 0.000	0.001	- 0.019	- 0.009	0.012	0.007
	(0.012)	(0.006)	(0.015)	(0.008)	(0.017)	(0.008)
Residual income	- 0.053***	- 0.026***	- 0.027***	- 0.013***	- 0.071***	- 0.034***
	(0.007)	(0.004)	(0.010)	(0.005)	(0.010)	(0.005)
Parent/Guardian/Carer	- 0.122***	- 0.061***	- 0.238***	- 0.119***	- 0.089*	- 0.044*
	(0.035)	(0.017)	(0.063)	(0.031)	(0.046)	(0.023)
Adults	0.158***	0.080***	0.067***	0.034***	0.136***	0.067***
	(0.014)	(0.007)	(0.023)	(0.012)	(0.020)	(0.010)
Children	0.001	- 0.000	- 0.114***	- 0.056***	0.075***	0.036***
	(0.016)	(0.008)	(0.037)	(0.018)	(0.019)	(0.009)
Couple	0.140***	0.066***	0.434***	0.215***	- 0.139***	- 0.070***
	(0.031)	(0.015)	(0.046)	(0.023)	(0.047)	(0.023)
Degree	- 0.198***	- 0.099***	0.089**	0.045**	- 0.379***	- 0.183***
	(0.032)	(0.016)	(0.042)	(0.021)	(0.046)	(0.023)
Constant	- 4.586***	- 2.451***	- 2.604***	- 1.516***	- 3.037***	- 1.666***

#### Table 2.6.2-1: Carer uptake: Three-way interaction - Employment status -Regressions

165427 Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Observations

(0.227)

Across the regressions in Table 2.6.2-1, the variables associated with the act, country and employment proved insignificant. However marginal effects in Table 2.6.2-2 and probit marginal effects in Table 2.10.1-1 suggest the act had a positive effect on those employed

(0.777)

73355

(0.114)

165427

(0.219)

92072

(0.446)

92072

(0.378)

73355

in the whole and younger sample, by 1.5% and 1.7% and 1.5% and 1.6% at the 5% level. This is encouraging news for policy makers as encouraging more people to provide care and especially those in employment is beneficial to those requiring care and those providing it. It also appears that the likelihood of providing care when we compare England with itself pre and post act is positive at the 1% level. The regressions in Table 2.6.2-1 provide a similar narrative to those discussed when looking at the plain interaction model in Table 2.6.1-1. Carer uptake: Two-way interaction - marginal effects

Table 2.6.2-2: Carer uptake: Three-way interaction – Employment status -Predicted Probabilities and Marginal Effects - Logit

Category	Logit	Logit	Logit	Logit	Logit	Logit
	All	All	50 & Over	50 & Over	Under 50	Under 50
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Scotland	0.067***	0.072***	0.073***	0.073***	0.059***	0.071***
Pre Act	(0.004)	(0.005)	(0.006)	(0.005)	(0.004)	(0.008)
Scotland	0.064***	0.086***	0.079***	0.093***	0.050***	0.071***
Post Act	(0.006)	(0.009)	(0.011)	(0.011)	(0.007)	(0.016)
England	0.062***	0.074***	0.071***	0.078***	0.052***	0.063***
Pre Act	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
England	0.074***	0.091***	0.089***	0.095***	0.060***	0.080***
Post Act	(0.003)	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)
Scotland	-0.003	0.014	0.006	0.020*	-0.008	-0.000
Difference	(0.007)	(0.009)	(0.012)	(0.012)	(0.008)	(0.018)
England	0.012***	0.017***	0.017***	0.017***	0.008**	0.017***
Difference	(0.003)	(0.004)	(0.005)	(0.005)	(0.003)	(0.006)
Difference in	0.015**	0.002	0.012 (0.012)	-0.003	0.017**	0.017
Diff (DID)	(0.007)	(0.010)		(0.012)	(0.008)	(0.019)
Observations	165427	165427	73355	73355	92072	92072

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

#### 2.6.3 Carer uptake - personal income

The next models to be presented are those interacting the act with personal income. This has been performed to determine the marginal impact of the act on personal income levels.

New carer	Logit	Probit	Logit	Probit	Logit	Probit
	All	All	50 & Over	50 & Over	Under 50	under 50
Post- act	0.046	0.022	0.253	0.124	- 0.314	- 0.146
	(0.149)	(0.071)	(0.179)	(0.086)	(0.250)	(0.116)
England	0.022	0.011	0.105	0.053	- 0.137	- 0.066
_	(0.072)	(0.036)	(0.085)	(0.043)	(0.112)	(0.055)
England Post-Act	0.207	0.100	- 0.008	- 0.007	0.571**	0.271**
(Post-act # England)	(0.150)	(0.072)	(0.181)	(0.087)	(0.250)	(0.116)
Income	0.037	0.018	0.028	0.014	0.021	0.011
	(0.032)	(0.016)	(0.038)	(0.019)	(0.050)	(0.024)
Post- act # Income	0.004	0.005	- 0.037	- 0.017	0.082	0.040
	(0.061)	(0.029)	(0.076)	(0.036)	(0.096)	(0.044)
England # Income	- 0.037	- 0.018	- 0.050	- 0.025	- 0.004	- 0.002
	(0.033)	(0.016)	(0.039)	(0.019)	(0.051)	(0.025)
Post- act # England #	- 0.020	- 0.010	0.034	0.017	- 0.111	- 0.052
Income (3 way interaction)	(0.063)	(0.030)	(0.079)	(0.038)	(0.099)	(0.046)
Age	0.080***	0.040***	0.023	0.013	0.001	0.001
-	(0.005)	(0.003)	(0.021)	(0.010)	(0.020)	(0.010)
Age # Age	- 0.001***	- 0.000***	- 0.000*	- 0.000*	0.000*	0.000*
(Age Squared)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	- 0.297***	- 0.148***	- 0.205***	- 0.102***	- 0.396***	- 0.193***
	(0.029)	(0.014)	(0.035)	(0.018)	(0.044)	(0.022)
Wave	- 0.091***	- 0.045***	- 0.132***	- 0.064***	- 0.081***	- 0.040***
	(0.012)	(0.006)	(0.015)	(0.007)	(0.016)	(0.008)
Ethnicity: White	- 0.125	- 0.063	- 0.103	- 0.049	- 0.184	- 0.091
	(0.133)	(0.067)	(0.190)	(0.096)	(0.173)	(0.085)
Ethnicity: Mixed	- 0.099	- 0.053	- 0.151	- 0.073	- 0.148	- 0.077
	(0.164)	(0.081)	(0.257)	(0.128)	(0.207)	(0.101)
Ethnicity: Asian	- 0.158	- 0.078	- 0.362*	- 0.179*	- 0.009	- 0.005
	(0.138)	(0.069)	(0.202)	(0.102)	(0.177)	(0.087)
Ethnicity: Black	- 0.203	- 0.101	- 0.180	- 0.089	- 0.263	- 0.127
	(0.145)	(0.072)	(0.209)	(0.105)	(0.187)	(0.092)
Disabled	0.028	0.016	- 0.066**	- 0.032**	0.208***	0.104***
	(0.027)	(0.013)	(0.032)	(0.016)	(0.042)	(0.021)
Employed	- 0.212***	- 0.108***	- 0.087**	- 0.043*	- 0.256***	- 0.131***
	(0.033)	(0.016)	(0.044)	(0.022)	(0.046)	(0.023)
Residual income	- 0.053***	- 0.026***	- 0.027***	- 0.013***	- 0.070***	- 0.034***
	(0.007)	(0.004)	(0.010)	(0.005)	(0.010)	(0.005)
Parent/Guardian/Carer	- 0.121***	- 0.061***	- 0.240***	- 0.119***	- 0.089*	- 0.044*
	(0.035)	(0.017)	(0.063)	(0.031)	(0.046)	(0.023)
Adults	0.157***	0.079***	0.067***	0.033***	0.135***	0.067***
	(0.014)	(0.007)	(0.023)	(0.012)	(0.020)	(0.010)
Children	0.001	- 0.000	- 0.114***	- 0.056***	0.074***	0.036***
	(0.016)	(0.008)	(0.037)	(0.018)	(0.019)	(0.009)
Couple	0.141***	0.067***	0.435***	0.215***	- 0.138***	- 0.069***
	(0.031)	(0.015)	(0.046)	(0.023)	(0.047)	(0.023)
Degree	- 0.198***	- 0.099***	0.089**	0.045**	- 0.379***	- 0.183***
	(0.032)	(0.016)	(0.042)	(0.021)	(0.046)	(0.023)
Constant	- 4.550***	- 2.431***	- 2.641***	- 1.529***	- 3.037***	- 1.670***
	(0.225)	(0.113)	(0.775)	(0.378)	(0.437)	(0.214)
Observations	165427	165427	/3355	/3355	92072	92072

Table 2.6.3-1: Carer uptake: Three-way interaction – Personal Income -Regressions

A personal income variable has replaced the employed interaction in our models. The results presented in Table 2.6.3-1 don't provide any evidence that the act had an impact on carer uptake. However, the marginal effect results in Table 2.6.3-2 and Table 2.10.1-2 have been split by income levels. These were the 25<sup>th</sup> and 75<sup>th</sup> percentiles for the specific samples. The results suggest that for the whole sample the act increased uptake of caring by 1.1 and 1.2 % for the lower income and 0.9 to 1 % for the higher income. The act did have a further impact on carer uptake for the younger sample for the lower income by 2.2 and 2.3 % for the lower income and 1.4 and 1.5 % for the higher income. Carer uptake: Three-way interaction – Employment status - marginal effect

Table 2.6.3-2: Carer uptake: Three-way interaction – Personal Income - PredictedProbabilities and Marginal Effects - Logit

Category (25 <sup>th</sup> and 75 <sup>th</sup> percentiles)	Logit All Income £769	Logit All Income £2341	Logit 50 & Over Income £758	Logit 50 & Over Income £2095	Logit Under 50 Income £782	Logit Under 50 Income £2504
Scotland Pre Act	0.067*** (0.003)	0.071*** (0.003)	0.072*** (0.005)	0.074*** (0.004)	0.060*** (0.004)	0.063*** (0.004)
Scotland Post Act	0.070*** (0.006)	0.074*** (0.006)	0.088*** (0.010)	0.087*** (0.008)	0.049*** (0.008)	0.057*** (0.007)
England Pre Act	0.066*** (0.002)	0.067*** (0.002)	0.076*** (0.003)	0.075*** (0.003)	0.054*** (0.002)	0.056*** (0.002)
England Post Act	0.081*** (0.003)	0.080*** (0.003)	0.094*** (0.005)	0.092*** (0.004)	0.066*** (0.003)	0.065*** (0.003)
Scotland Difference	0.003 (0.007)	0.003 (0.006)	0.016 (0.010)	0.012 (0.009)	- 0.011 (0.009)	- 0.006 (0.008)
England Difference	0.015*** (0.003)	0.013*** (0.003)	0.018*** (0.005)	0.017*** (0.005)	0.012*** (0.004)	0.009** (0.004)
Difference	0.012*	0.010*	0.002	0.005	0.023***	0.015*
in Diff (DID)	(0.007)	(0.006)	(0.010)	(0.009)	(0.009)	(0.008)
Observations	165427	165427	73355	73355	92072	92072

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Overall, these results suggest the act had a very small influence on the uptake of caring. However, this must be viewed through the lens of a declining likelihood to provide care where in Scotland the decline was real in the post act period.

#### 2.6.4 Carer retention - propensity to stop caring

We now move on to carer retention. These again employ a XT specification to account for the longitudinal nature of the survey. The dependent variable is newnoncarer i.e. someone has left care. Therefore, a negative coefficient will be positive for carer retention.

	1	-		-		-
New non carer	Logit	Probit	Logit	Probit	Logit	Probit
	All	All	50 & Over	50 & Over	Under 50	Under 50
Post-act	0.373***	0.234***	0.398***	0.252***	0.323**	0.200**
	(0.081)	(0.050)	(0.102)	(0.063)	(0.140)	(0.086)
England	- 0.144***	- 0.090***	- 0.172***	- 0.107***	- 0.091	- 0.057
	(0.042)	(0.026)	(0.055)	(0.034)	(0.065)	(0.040)
England Post-Act	- 0.260***	- 0.163***	- 0.290***	- 0.183***	- 0.195	- 0.120
(Post- act # England)	(0.077)	(0.048)	(0.096)	(0.060)	(0.138)	(0.083)
Employed	0.069**	0.043**	0.042	0.026	0.057	0.035
	(0.028)	(0.018)	(0.039)	(0.024)	(0.045)	(0.028)
Age	- 0.037***	- 0.023***	- 0.069***	- 0.043***	- 0.014	- 0.008
	(0.004)	(0.002)	(0.020)	(0.012)	(0.019)	(0.012)
Age # Age	0.000***	0.000***	0.001***	0.000***	0.000	0.000
(Age Squared)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.063***	0.039***	0.062**	0.038**	0.051	0.032
	(0.024)	(0.015)	(0.031)	(0.019)	(0.040)	(0.025)
Wave	0.082***	0.051***	0.086***	0.053***	0.076***	0.048***
	(0.011)	(0.006)	(0.013)	(0.008)	(0.027)	(0.012)
Ethnicity: White	- 0.020	- 0.013	- 0.333	- 0.207	0.185	0.115
	(0.142)	(0.088)	(0.261)	(0.162)	(0.167)	(0.103)
Ethnicity: Mixed	0.156	0.097	0.127	0.080	0.216	0.135
	(0.160)	(0.099)	(0.301)	(0.187)	(0.188)	(0.117)
Ethnicity: Asian	0.065	0.040	- 0.187	- 0.116	0.220	0.137
	(0.145)	(0.090)	(0.267)	(0.166)	(0.170)	(0.105)
Ethnicity: Black	0.282*	0.175*	0.046	0.028	0.401**	0.250**
	(0.151)	(0.093)	(0.274)	(0.170)	(0.180)	(0.111)
Disabled	0.097***	0.060***	0.087***	0.054***	0.103**	0.064***
	(0.024)	(0.015)	(0.030)	(0.019)	(0.041)	(0.025)
Income	- 0.000	- 0.000	- 0.002	- 0.002	0.002	0.001
	(0.009)	(0.005)	(0.011)	(0.007)	(0.014)	(0.009)
Residual income	- 0.009	- 0.005	- 0.008	- 0.005	- 0.009	- 0.005
	(0.007)	(0.004)		(0.006)	(0.010)	(0.006)
Parent/Guardian/Carer	- 0.040	- 0.025	0.015	0.009	- 0.095*	- 0.059**
	(0.036)	(0.022)	(0.073)	(0.045)	(0.049)	(0.030)
Adults	0.044***	0.027***	0.046**	0.028**	0.050**	0.031***
	(0.014)	(0.008)	(0.022)	(0.013)	(0.020)	(0.012)
Children	0.013	0.008	0.025	0.016	- 0.003	- 0.002
	(0.015)	(0.009)	(0.036)	(0.022)	(0.017)	(0.011)
Couple	- 0.070***	- 0.044***	- 0.096**	- 0.060**	- 0.045	- 0.029
Desure	(0.027)	(0.017)	(0.039)	(0.024)	(0.044)	(0.026)
Degree	- 0.033	-0.021	- 0.049	- 0.031	- 0.018	- 0.011
Canatant	(0.027)			(0.023)	(0.040)	(0.025)
Constant	0.259	0.163	1.605**	0.998**	- 0.371	- 0.233
01	(0.187)	(0.116)	(0.722)	(0.448)	(0.400)	(0.235)
Observations	29623	29623	17903	17903	11720	11720

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

The figures in Table 2.6.4-1 and Table 2.6.4-2 suggest the act had a positive effect on carer retention the negative figure in Table 2.6.4-1 suggest likelihood to leave care was reduced post act in England. Table 2.6.4-2 confirms this with the act increasing retention by 6.4 and 7.2 % for the "whole" and "older" sample. However, retention does appear to be improved significantly for the younger sample. The figures remain negative, but the significance does not meet the 10 % which would indicate there is a 10 % chance of observing the results or something more extreme if the null hypothesis is true.

	•					
Category	Logit	Probit	Logit	Probit	Logit	Probit
	All	All	50 & Over	50 & Over	Under50	Under50
Scotland	0.436***	0.436***	0.423***	0.423***	0.455***	0.455***
Pre Act	(0.010)	(0.013)	(0.013)	(0.013)	(0.025)	(0.017)
Scotland	0.528***	0.528***	0.520***	0.522***	0.534***	0.534***
Post Act	(0.016)	(0.016)	(0.020)	(0.019)	(0.033)	(0.030)
England	0.402***	0.402***	0.382***	0.382***	0.433***	0.432***
Pre Act	(0.004)	(0.005)	(0.005)	(0.005)	(0.015)	(0.009)
England	0.429***	0.429***	0.407***	0.408***	0.464***	0.464***
Post Act	(0.009)	(0.010)	(0.011)	(0.011)	(0.027)	(0.015)
Scotland	0.092***	0.092***	0.098***	0.099***	0.079**	0.079**
Difference	(0.020)	(0.020)	(0.025)	(0.025)	(0.034)	(0.034)
England	0.027**	0.028***	0.025*	0.026*	0.031*	0.031*
Difference	(0.011)	(0.011)	(0.013)	(0.014)	(0.018)	(0.018)
Difference in Diff	- 0.064***	- 0.064***	- 0.072***	- 0.073***	- 0.048	- 0.048
(DID)	(0.019)	(0.019)	(0.023)	(0.023)	(0.033)	(0.032)
Observations	29623	29623	17903	17903	11720	11720

Table 2.6.4-2: Carer retention: Two-way interaction - Predicted Probabilities andMarginal Effects

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Note for the reader: a positive figure refers to an individual's propensity to provide informal care decreasing, they are more likely to become a non- carer.

#### 2.6.5 Carer retention – Employment status

The next models include the employment status into the interaction. These are presented in Table 2.6.5-1 and Table 2.6.5-2 and Table 2.10.2-1. The marginal effect of the act is larger for those "Unemployed" 7.4 vs 5.7 and 5.6 % for the "whole sample". When the sample is restricted to those "Over 50" the act aids retention by 7.2%.

# Table 2.6.5-1: Carer retention: Three-way interaction - Employment status - Regressions

New non carer	Logit	Probit	Logit	Probit	Logit	Probit
	All	All	50 & Over	50 & Over	Under 50	Under 50
Post- act	0.363***	0.228***	0.366***	0.232***	0.339	0.210
	(0.114)	(0.071)	(0.127)	(0.079)	(0.300)	(0.186)
England	- 0.140**	- 0.087**	- 0.148**	- 0.091**	- 0.112	- 0.071
	(0.061)	(0.038)	(0.068)	(0.042)	(0.138)	(0.085)
England Post-Act	- 0.298***	- 0.188***	- 0.290**	- 0.183**	- 0.324	- 0.201
(Post-act # England)	(0.115)	(0.071)	(0.125)	(0.078)	(0.307)	(0.190)
Employed	0.058	0.036	0.077	0.048	0.004	0.001
	(0.082)	(0.051)	(0.110)	(0.068)	(0.150)	(0.094)
Post- act # Employed	0.019	0.010	0.071	0.044	- 0.016	- 0.009
	(0.148)	(0.092)	(0.182)	(0.113)	(0.341)	(0.210)
England # Employed	- 0.008	- 0.006	- 0.057	- 0.036	0.025	0.016
	(0.084)	(0.052)	(0.113)	(0.070)	(0.156)	(0.097)
Post-act # England #	0.071	0.047	0.003	0.002	0.171	0.106
Employed	(0.158)	(0.099)	(0.196)	(0.122)	(0.354)	(0.219)
Age	- 0.037***	- 0.023***	- 0.069***	- 0.043***	- 0.014	- 0.009
6	(0.004)	(0.002)	(0.020)	(0.012)	(0.019)	(0.012)
Age Squared	0.000***	0.000***	0.001***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.063***	0.039***	0.062**	0.039**	0.051	0.031
	(0.024)	(0.015)	(0.031)	(0.019)	(0.040)	(0.025)
Wave	0.082***	0.051***	0.086***	0.053***	0.077***	0.048***
	(0.011)	(0.006)	(0.013)	(0.008)	(0.027)	(0.012)
Ethnicity: White	- 0.017	- 0.011	- 0.326	- 0.203	0.186	0.116
	(0.142)	(0.088)	(0.260)	(0.162)	(0.166)	(0.103)
Ethnicity: Mixed	0.160	0.099	0.133	0.084	0.221	0.138
	(0.160)	(0.099)	(0.301)	(0.187)	(0.188)	(0.116)
Ethnicity: Asian	0.067	0.042	- 0.183	- 0.113	0.223	0.139
	(0.145)	(0.090)	(0.267)	(0.166)	(0.170)	(0.105)
Ethnicity: Black	0.284*	0.176*	0.051	0.031	0.403**	0.251**
	(0.151)	(0.093)	(0.273)	(0.170)	(0.180)	(0.111)
Disabled	0.097***	0.060***	0.088***	0.054***	0.103**	0.064***
_	(0.024)	(0.015)	(0.030)	(0.019)	(0.041)	(0.025)
Income	- 0.001	- 0.000	- 0.003	- 0.002	0.002	0.001
	(0.009)	(0.005)	(0.011)	(0.007)	(0.014)	(0.009)
Residual income	- 0.009	- 0.005	- 0.008	- 0.005	- 0.008	- 0.005
	(0.007)	(0.004)	(0.010)	(0.006)	(0.010)	(0.006)
Parent/Guardian/Carer	- 0.039	- 0.025	0.015	0.009	- 0.095*	- 0.060**
A .114.	(0.030)	(0.022)	(0.073)	(0.045)	(0.049)	(0.030)
Adults	$0.044^{33}$	0.027	$0.040^{**}$	$0.028^{**}$	0.051**	$0.032^{****}$
Children	(0.014)	(0.008)	(0.022)	(0.015)	(0.020)	(0.012)
Chindren	(0.012)	0.008	(0.023)	(0.013)	- 0.003	-0.002
Coupla	0.070**	0.009)	0.006**	0.060**	(0.017)	0.020
Couple	$-0.070^{+1}$	-0.044	$-0.090^{+1}$	$-0.000^{11}$	-0.040	(0.029)
Degree	0.027	0.020	0.039)	0.024)	0.044)	0.012
Degree	(0.033)	(0.020)	(0.049)	(0.030)	(0.018)	(0.012)
Constant	0.263	0.165	1 575**	0.023	- 0 332	- 0.208
Constant	(0.190)	(0.103)	(0.723)	(0.448)	(0.415)	(0.200)
Observations	29623	29623	17903	17903	11720	11720
COSCI varions	27025	27025	17905	17905	11/20	11/20

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

The next set of margins are from the 3- way interaction of the act including employment status from the same models used in the previous section.

Table 2.6.5-2: Carer retention: Three-way interaction – Employment status -Predicted Probabilities and Marginal Effects - Logit

Category	Logit	Logit	Logit	Logit	Logit	Logit
	All	All	50 & Over	50 & Over	Under 50	Under 50
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Scotland	0.443***	0.429***	0.433***	0.415***	0.456***	0.455***
Pre Act	(0.014)	(0.014)	(0.022)	(0.016)	(0.020)	(0.034)
Scotland	0.537***	0.518***	0.541***	0.504***	0.535***	0.538***
Post Act	(0.022)	(0.023)	(0.028)	(0.025)	(0.037)	(0.066)
England	0.407***	0.395***	0.384***	0.380***	0.434***	0.428***
Pre Act	(0.006)	(0.006)	(0.008)	(0.007)	(0.012)	(0.015)
England	0.445***	0.411***	0.420***	0.398***	0.476***	0.431***
Post Act	(0.010)	(0.011)	(0.014)	(0.013)	(0.016)	(0.021)
Scotland	0.094***	0.089***	0.108***	0.090***	0.079**	0.083
Difference	(0.026)	(0.028)	(0.036)	(0.031)	(0.038)	(0.074)
England	0.037***	0.015	0.036**	0.018	0.041**	0.003
Difference	(0.012)	(0.013)	(0.017)	(0.015)	(0.019)	(0.025)
Difference in	- 0.057**	- 0.074***	- 0.072**	- 0.072**	- 0.038	- 0.080
Diff (DID)	(0.026)	(0.028)	(0.036)	(0.031)	(0.038)	(0.075)
Observatio ns	29623	29623	17903	17903	11720	11720

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

• Note for the reader: a positive figure refers to an individual's propensity to provide informal care decreasing, they are more likely to become a non- carer.

#### 2.6.6 Carer retention - personal income

The subsequent models interact personal income with the act to determine if income levels impact the retention of carers after the act was introduced. These are presented in Table 2.6.6-1, Table 2.6.6-2 and Table 2.10.2-2. These results suggest the act had a positive effect on carer retention. For the whole sample, our results suggest the act increases retention by 4.2 and 7.4 % for the whole sample at both low and high incomes (25<sup>th</sup> and 75<sup>th</sup> percentiles). For the older sample this increase to 4.7 and 8.2 %, respectively.

### Table 2.6.6-1: Carer retention: Three-way interaction - Personal Income -Regressions

New non carer	Logit	Probit	Logit	Probit	Logit	Probit
	All	All	50 & Over	50 & Over	Under 50	Under 50
Post-act	0.182	0.115	0.214	0.137	0.112	0.070
	(0.121)	(0.075)	(0.140)	(0.087)	(0.233)	(0.142)
England	- 0.247***	- 0.153***	- 0.249***	- 0.155***	- 0.233**	- 0.144**
	(0.065)	(0.041)	(0.081)	(0.051)	(0.112)	(0.068)
England Post-Act	- 0.103	- 0.065	- 0.108	- 0.070	- 0.076	- 0.048
(Post- act # England)	(0.121)	(0.075)	(0.140)	(0.087)	(0.236)	(0.143)
Income	- 0.068**	- 0.042**	- 0.052	- 0.033	- 0.090*	- 0.055*
	(0.032)	(0.020)	(0.041)	(0.025)	(0.053)	(0.032)
Post- act # Income	0.113**	0.070**	0.111**	0.069**	0.118	0.073
	(0.049)	(0.030)	(0.057)	(0.035)	(0.094)	(0.056)
England # Income	0.065**	0.040**	0.051	0.032	0.083	0.051
	(0.033)	(0.020)	(0.042)	(0.026)	(0.054)	(0.032)
Post- act # England #	- 0.094*	- 0.058*	- 0.111*	- 0.069*	- 0.067	- 0.041
Income (3 way interaction)	(0.053)	(0.032)	(0.061)	(0.038)	(0.098)	(0.059)
Age	- 0.037***	- 0.023***	- 0.069***	- 0.043***	- 0.015	- 0.009
	(0.004)	(0.002)	(0.020)	(0.012)	(0.019)	(0.012)
Age Squared	0.000***	0.000***	0.001***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.063***	0.039***	0.063**	0.039**	0.051	0.032
	(0.024)	(0.015)	(0.031)	(0.019)	(0.040)	(0.025)
Wave	0.082***	0.051***	0.086***	0.053***	0.077***	0.048***
	(0.011)	(0.006)	(0.013)	(0.008)	(0.026)	(0.012)
Ethnicity: White	- 0.023	- 0.015	- 0.331	- 0.206	0.176	0.111
	(0.141)	(0.087)	(0.261)	(0.162)	(0.166)	(0.103)
Ethnicity: Mixed	0.152	0.094	0.128	0.080	0.207	0.129
	(0.160)	(0.099)	(0.301)	(0.187)	(0.188)	(0.116)
Ethnicity: Asian	0.063	0.039	- 0.186	- 0.115	0.214	0.134
	(0.144)	(0.089)	(0.267)	(0.166)	(0.170)	(0.105)
Ethnicity: Black	0.279*	0.173*	0.046	0.029	0.392**	0.245**
	(0.150)	(0.093)	(0.273)	(0.170)	(0.179)	(0.111)
Disabled	0.097***	0.060***	0.087***	0.054***	0.104**	0.064***
	(0.024)	(0.015)	(0.030)	(0.019)	(0.041)	(0.025)
Employed	0.072**	0.044**	0.043	0.027	0.061	0.038
	(0.028)	(0.018)	(0.039)	(0.024)	(0.046)	(0.028)
Residual income	- 0.009	- 0.005	- 0.008	- 0.005	- 0.009	- 0.005
	(0.007)	(0.004)	(0.010)	(0.006)	(0.010)	(0.006)
Parent/Guardian/Carer	- 0.039	- 0.025	0.017	0.010	- 0.095*	- 0.059**
	(0.036)	(0.022)	(0.073)	(0.045)	(0.049)	(0.030)
Adults	0.044***	0.027***	0.045**	0.028**	0.051**	0.032***
	(0.014)	(0.009)	(0.022)	(0.013)	(0.020)	(0.012)
Children	0.013	0.008	0.025	0.016	- 0.002	- 0.001
	(0.015)	(0.009)	(0.036)	(0.022)	(0.018)	(0.011)
Couple	- 0.071***	- 0.044***	- 0.096**	- 0.060**	- 0.048	- 0.030
	(0.027)	(0.017)	(0.039)	(0.024)	(0.044)	(0.027)
Degree	- 0.031	- 0.019	- 0.048	- 0.030	- 0.015	- 0.010
	(0.027)	(0.017)	(0.037)	(0.023)	(0.040)	(0.025)
Lonstant	0.365*	0.229*	1.684**	1.047**	- 0.196	- 0.125
	(0.191)	(0.118)	(0.725)	(0.449)	(0.402)	(0.239)
Observations	29623	29623	17903	17903	11720	11720

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Category	Logit	Logit	Logit	Logit	Logit	Logit
(25 <sup>th</sup> and 75 <sup>th</sup>	All ages	All ages	50 & Over	50 & Over	Under 50	Under 50
percentiles)	£706	£2097	£701	£2000	£711	£2216
Scotland	0.451***	0.428***	0.433***	0.416***	0.477***	0.443***
Pre Act	(0.012)	(0.011)	(0.015)	(0.014)	(0.023)	(0.020)
Scotland	0.515***	0.531***	0.505***	0.524***	0.525***	0.535***
Post Act	(0.020)	(0.016)	(0.022)	(0.020)	(0.043)	(0.032)
England	0.403***	0.402***	0.382***	0.382***	0.434***	0.432***
Pre Act	(0.005)	(0.004)	(0.006)	(0.005)	(0.013)	(0.012)
England	0.425***	0.430***	0.407***	0.407***	0.452***	0.468***
Post Act	(0.009)	(0.009)	(0.012)	(0.011)	(0.016)	(0.015)
Scotland	0.064***	0.103***	0.072**	0.107***	0.048	0.092***
Difference	(0.024)	(0.020)	(0.029)	(0.025)	(0.045)	(0.035)
England	0.022*	0.029***	0.025*	0.025*	0.018	0.037**
Difference	(0.011)	(0.011)	(0.015)	(0.014)	(0.019)	(0.018)
Difference in	- 0.042*	- 0.074***	- 0.047*	- 0.082***	- 0.031	- 0.055
Diff (DID)	(0.023)	(0.019)	(0.028)	(0.024)	(0.045)	(0.034)
Observatio ns	29623	29623	17903	17903	11720	11720

Table 2.6.6-2: Carer retention: Three-way interaction – Personal Income -Predicted Probabilities and Marginal Effects - Logit

• Note for the reader: a positive figure refers to an individual's propensity to provide informal care decreasing, they are more likely to become a non- carer.

## 2.7 Summary of the models

In this section I will briefly discuss the results both in the main model and the robustness checks. The results being discussed are the marginal effects of the act. The main results are under the heading effect, moving the act to a year earlier are under robustness.

#### 2.7.1 Results Summary and discussion

#### Table 2.7.1-1: Summary of Predicted Probabilities and Marginal Effects results

	Caring	Up	otake	Re	Retention	
Model	Sample	Effect %	Robustness %	Effect %	Robustness %	
Logit	All	1.0*	1.0**	-6.4***	-2.4	
Probit	All	0.9*	1.0**	-6.4***	-2.4	
Logit	50 & Over	0.4	0.2	-7.2***	-1.3	
Probit	50 & Over	0.3	0.1	-7.3***	-1.4	
Logit	Under 50	1.7**	1.8***	-4.8	-4.0	
Probit	Under 50	1.6**	1.8***	-4.8	-4.0	
	Employ	ved interacti	on			
Logit	All employed	1.5**	1.4**	-5.7**	-0.2	
Logit	All unemployed	0.2	0.4	-7.4***	-5.2**	
Logit	50 & Over employed	1.2	0.9	-7.2**	4.6	
Logit	50 & Over unemployed	-0.3	-0.4	-7.2**	-5.9**	
Logit	Under 50 employed	1.7**	1.6**	-3.8	-4.7	
Logit	Under 50 unemployed	1.7	2.7*	-8.0	-1.0	
Probit	All employed	1.5**	1.4**	-5.6**	-0.2	
Probit	All unemployed	0.2	0.3	-7.4***	-5.2**	
Probit	50 & Over employed	1.1	0.9	-7.2**	4.6	
Probit	50 & Over unemployed	-0.3	-0.5	-7.3**	-6.0**	
Probit	Under 50 employed	1.6**	1.5**	-3.8	-4.8	
Probit	Under 50 unemployed	1.7	2.7*	-7.9	-1.0	
	Income interaction (Low - 25 <sup>th</sup>	<sup>1</sup> Percentile	<u>&amp; High – 75<sup>th</sup></u>	Percentil	e)	
Logit	All low	1.2*	1.1**	-4.2*	-0.8	
Logit	All high	1.0*	1.1**	-7.4***	-3.3*	
Logit	50 & Over low	0.2	-0.1	-4.7*	0.2	
Logit	50 & Over high	0.5	0.3	-8.2***	-2.0	
Logit	Under 50 low	2.3***	2.3***	-3.1	-2.6	
Logit	Under 50 high	1.5*	1.6**	-5.5	-5.1*	
Probit	All low	1.1*	1.1**	-4.2*	-0.9	
Probit	All high	0.9*	1.1**	-7.4***	-3.2*	
Probit	50 & Over low	0.1	-0.1	-4.7*	0.1	
Probit	50 & Over high	0.4	0.3	-8.2***	-2.1	
Probit	Under 50 low	2.2***	2.3***	-3.1	-2.6	
Probit	Under 50 high	1.4*	1.6**	-5.4	-5.1*	

Coefficients are percentages, \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 2.7.1-1 provides the results from all the models.

#### 2.7.2 Carer uptake discussion

Carer uptake main models: in the original model the effect of the act was an increase in carer uptake by 0.9 % and 1 % for the whole sample, statistically significant at 10 %, for logit and probit models. This was the same under the robustness models statistically significant at 5%. The models do not indicate that the act had a statistically significant effect on the older sample, corroborated in both models. For the younger sample, the results were statistically significant at 5 % and 1 %. Increasing carer uptake by 1.6 % and 1.7 % for the main results and 1.8 % across the robustness specifications.

Carer uptake interacted with employment status: The logit models indicate that the act increased carer uptake by 1.5 % and 1.4 % across the main and robust models, statistically significant at 5 %. It did not appear to influence carer uptake for all of those unemployed, the younger sample. It did however increase carer uptake by 1.6 % and 1.7 % for the younger sample who were employed, statistically significant at the 5 % level. For this sample who were unemployed it only had an effect on those in the robust sample by increasing carer uptake by 2.7 %, statistically significant at 10%.

The probit models indicate that the act increased carer uptake by 1.5 % and 1.4 % across the main and robust models, statistically significant at 5 %. It did not appear to influence carer uptake for all of those unemployed, the younger sample. It did however increase carer uptake by 1.6 % and 1.5 % for the younger sample who were employed, statistically significant at the 5 % level. For this sample who were unemployed it only had an effect on those in the robust sample by increasing carer uptake by 2.7 %, statistically significant at 10%. I do not possess a valid hypothesis why the robustness sample in both models for those under 50 who were unemployed provided a positive effect.

Carer uptake interacted with personal incomes: the logit models provide some evidence that across the whole sample the act increased carer uptake by 1.2 % and 1 % for low and high personal incomes respectively, statistically significant at 10%. The older sample however does not appear to be impacted by the act. The results for the younger sample indicate the act increased uptake by 2.3 % statistically significant at 1%, and 1.5 % and 1.6 % at 10 % and 5 % respectively. The probit models provide some evidence that across the whole sample the act increased carer uptake by 1.1 % and between 0.9 % and 1.1 %

for low and high incomes respectively, statistically significant at 10% and 5% for the robustness models. The older sample however does not appear to be impacted. The results for the younger sample indicate the act increased carer uptake by 2.2% and 2.3% statistically significant at 1%, and carer uptake by 1.4% and 1.6% at 10% respectively, for the lower and higher personal incomes respectively. The effect of the act on the results are fairly consistent between the models.

Overall, the act appeared to increase the uptake of informal care modestly. The effect ranges from 0.9 % to 2.7 %, including the robustness models. This is encouraging but this will not be enough to meet the growing demand for care. However, the uptake of the act is not the only element impacting informal carers. Carer retention also matters. Important for policy makers is the acts increase in uptake across the younger sample (those under 50 years old). It also increased the uptake of informal care for those who were employed. This will be encouraging as it may allow those who do work to also provide care or at least be encouraged to. The effect of the act is larger on those with higher personal incomes. This may be expected as these individuals may be able to exchange labour hours for care hours but every cohort across various incomes need to be encouraged to provide informal care to reduce the cost on the taxpayer.

#### 2.7.3 Carer retention

Carer retention main models: for the whole sample the act improved carer retention by 6.4 % at the 1% level for the whole sample. These results were not matched by the robustness models. For the older sample this increased to 7.2 % and 7.3 % at the 1% level. The act appeared to not impact retention in the younger sample.

Carer retention interacted with employment status: Carer retention was increased by the act for the whole sample across employment status' 5.7 % and 7.4 % at the 5 % and 1 % levels. For the older sample the act increased retention by 7.2 % at the 5 % level for both those employed and unemployed. Robustness results were an increase of 5.2 % and 5.9 % at the 5 % level for unemployed and the younger unemployed sample. For the probit models, carer retention was increased by the act for the whole sample across employment status' 5.6 % and 7.4 % at the 5 % level. For the older sample the act increased retention by 7.2 % and 1 % levels. For the older sample the act increased retention by 7.2 % and 7.3 % at the 5 % level, for both those employed and unemployed. Robustness results were an increase of 5.2 % and 6 % at the 5 % level for unemployed and the younger unemployed.

Carer retention interacted with personal income. Carer retention was increased by the act for the whole sample across personal incomes 4.2 % and 7.4 % at the 10 % and 1 % levels. For the older sample the act increased retention by 4.7 % at the 10 % level for those with a lower income whilst retention increased by 8.2 % for those on high incomes. Robustness results were an increase of 3.3 % at the 10% level for the whole sample on high incomes. The younger sample was not impacted by the act at a statistically significant level. For the Probit models, carer retention was increased by the act for the whole sample across personal incomes 4.2 % and 7.4 % at the 10 % level for the whole sample on high incomes. For the Probit models, carer retention was increased by the act for the whole sample across personal incomes 4.2 % and 7.4 % at the 10 % level for those with a lower income whilst retention increased by 8.2 % for those on higher incomes. Robustness results were an increase of 3.2 % at the 10 % level for those with a lower income whilst retention increased by 8.2 % for those on higher incomes. Robustness results were an increase of 3.2 % at the 10% level for the whole sample on high incomes. The younger sample was not impacted by the act at a statistically significant level.

Overall, the act appeared to increase the retention rates of informal care modestly. The effect ranges from 4.2 % to 8.2 %. This is encouraging and these results are larger than uptake. Across the results it appears retention is increasing post act in the older sample. However there appears to be no impact on the younger sample. This is disappointing because younger people may indeed provide care but the length of their service is not improved after the act. This does not consider the type of care they provide but generally this will be disappointing for policy makers as the act increased the uptake of care in the younger sample, however it does not appear to improve the retention for this cohort. It may be the cost of providing care is too great in this age group and that the act in general may have no effect on this cohort. The results for the older sample may be as expected. As people get older those around them get older and the likelihood to provide or receive care increases with age. This cohort may expect and pre plan the likelihood of them being required to provide care and therefore the act may be supportive but these won't appear statistically in an econometric study.

In conclusion, the overall message from this research is that the act increases uptake of care generally in the younger cohort whilst retention improves in the older cohort.

## 2.8 Additional legislation and interventions

The difficulty in adjusting to the demands of care are huge for any family. The related literature identified some of the difficulties associated with providing care. I believe the aims of the Act are justified and the initiatives should help support carers. However, the financial penalty in the labour market desires additional legislation. Germany includes informal care in their labour market structure to a higher degree, this enables individuals to take breaks to provide care in addition to keeping them attached, similar to maternity leave in the United Kingdom. This could be beneficial for both carers and businesses.

Policy makers will also have to address the negative image of working in the formal care sector. Wages will have to rise and stable contracts will be required. Unlike other developed economies the UK has a low level of private health insurance, but this has risen in the wake of NHS backlogs. A similar scheme associated with long term care may be required, spreading the risk of this among the population will be tricky as this type of insurance will be expensive, require considerable efforts from the government to create a working market and the involvement of capital markets. The backlash to this will be that national insurance can already be considered a tax to pay for care.

Offering welfare payments to those providing informal care will need to be considered given the financial penalties experienced by informal carers. Using informal care when suitable is considerably cheaper than formal care provision. The very nature of this provides an opportunity for some innovative and unique interventions. There still remains a lack of 24/7 support for informal carers. Many of these care scenarios could end up in A&E, putting further pressure on key frontline NHS services but many of these could be mitigated by community support, that is accessible when needed, free and effective. The NHS has implemented 111 for those that need medical support which is not critical, where handlers can triage, signpost and connect users to the services they require. Children can call Childline, the elderly can call Age concern for support and I believe a similar service for all informal carers would be beneficial. As society gets older and more social care is required there is a considerable need for a connected approach to social care that encompasses policies, businesses and public institutions. The act provided significant rights for those providing informal care but additional efforts will have to address the additional costs and concerns of those providing care.

## 2.9 Conclusion

In this chapter, I have demonstrated that a "revolutionary piece of legislation" concerned with care, the Care Act 2014, had some impact on those in England with respect to informal care uptake and retention. The results presented in this study indicate that the act modestly improved the uptake of informal carers across all three of our model specifications (all, employment and personal income), with these ranging from 0.9 % to 2.3 % (to 2.7% in the robustness sample). These were largely a result of the acts effect on our younger sample, those under 50 years of age. In contrast, carer retention rates experienced a higher increase relative to uptake. The act's impact across all three of our model specifications (all, employment and personal income), was associated with retention rates increasing between 4.2 % and 8.2 %, with these largely a result of the acts impact on our older sample, those 50 and over. These results rely on Scotland being a suitable control in the (DID) models, which like England is experiencing similar social care problems in their population. These results will to some extent be encouraging for policymakers. However, the magnitude of these results in particular the uptake rates are very modest. These could easily be undone by fiscal events like those being experienced in 2024.

Further policies are needed and a coordinated effort from many of the public institutions to embed informal care in their considerations and practices are needed. Informal care is still costly and unpredictable. The act also depends on those providing informal care to be assessed quickly and diligently, this is dependent on efficient administration and availability of resources. The UK should investigate the differing policies of its neighbours where society's norms with regard to social care are more ingrained in other aspects of life. The UK has an aversion for debate on the NHS and public health but social care is unequivocally connected. Public health, labour market policies and attitudes towards social care will need to evolve to meet society's demands for care.

#### 2.10.1 Carer uptake

# Table 2.10.1-1: Carer uptake: Three-way interaction - Employment status -Predicted Probabilities and Marginal Effects - Probit

Category	Probit	Probit	Probit	Probit	Probit	Probit
	All	All	50 & Over	50 & Over	Under 50	Under 50
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Scotland	0.067***	0.072***	0.074***	0.073***	0.058***	0.071***
Pre Act	(0.004)	(0.004)	(0.006)	(0.005)	(0.004)	(0.008)
Scotland	0.065***	0.086***	0.079***	0.093***	0.051***	0.071***
Post Act	(0.006)	(0.008)	(0.010)	(0.010)	(0.006)	(0.016)
England	0.062***	0.074***	0.072***	0.078***	0.052***	0.063***
Pre Act	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
England	0.074***	0.090***	0.088***	0.094***	0.060***	0.079***
Post Act	(0.003)	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)
Scotland Difference	-0.002	0.014	0.005	0.020*	-0.007	-0.001
	(0.006)	(0.009)	(0.012)	(0.011)	(0.007)	(0.018)
England Difference	0.012***	0.016***	0.016***	0.016***	0.009**	0.016***
	(0.003)	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)
Difference in Diff	0.015**	0.002	0.011	-0.003	0.016**	0.017
(DID)	(0.007)	(0.010)	(0.012)	(0.012)	(0.008)	(0.019)
Observations	165427	165427	73355	73355	92072	92072

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Category	Probit	Probit	Probit	Probit	Probit	Probit
(25 <sup>th</sup> and 75 <sup>th</sup>	All	All	50 & Over	50 & Over	Under50	Under50
percentiles)	£769	£2341	£758	£2095	£782	£2504
Scotland	0.067***	0.071***	0.072***	0.075***	0.060***	0.063***
Pre Act	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Scotland	0.070***	0.074***	0.087***	0.087***	0.050***	0.058***
Post Act	(0.006)	(0.005)	(0.009)	(0.008)	(0.007)	(0.007)
England	0.066***	0.067***	0.076***	0.075***	0.054***	0.055***
Pre Act	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
England	0.080***	0.080***	0.093***	0.091***	0.065***	0.065***
Post Act	(0.003)	(0.003)	(0.005)	(0.004)	(0.003)	(0.003)
Scotland	0.003	0.004	0.015	0.012	-0.010	-0.005
Difference	(0.006)	(0.006)	(0.010)	(0.008)	(0.008)	(0.007)
England	0.014***	0.013***	0.017***	0.016***	0.012***	0.009***
Difference	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)	(0.003)
Difference in	0.011*	0.009*	0.001	0.004	0.022***	0.014*
Diff (DID)	(0.006)	(0.006)	(0.010)	(0.008)	(0.008)	(0.007)
Observations	165427	165427	73355	73355	92072	92072

Table 2.10.1-2: Carer uptake: Three-way interaction – Personal Income - PredictedProbabilities and Marginal Effects - Probit

#### 2.10.2 Carer retention

Predicted Prol	oabilities a	nd Margina	al Effects - P	Probit		
Category	Probit	Probit	Probit	Probit	Probit	Probit
	All	All	50 & Over	50 & Over	Under50	Under50
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Scotland	0.443***	0.429***	0.433***	0.415***	0.456***	0.455***
Pre Act	(0.014)	(0.016)	(0.022)	(0.016)	(0.019)	(0.033)
Scotland	0.537***	0.519***	0.542***	0.506***	0.535***	0.538***
Post Act	(0.022)	(0.023)	(0.028)	(0.025)	(0.034)	(0.065)
England	0.407***	0.395***	0.384***	0.380***	0.434***	0.428***
Pre Act	(0.006)	(0.006)	(0.008)	(0.007)	(0.009)	(0.012)
England	0.445***	0.411***	0.421***	0.398***	0.476***	0.431***
Post Act	(0.010)	(0.011)	(0.014)	(0.013)	(0.017)	(0.021)
Scotland	0.094***	0.090***	0.109***	0.091***	0.079**	0.083
Difference	(0.026)	(0.028)	(0.036)	(0.031)	(0.038)	(0.073)
England	0.038***	0.016	0.036**	0.018	0.041**	0.003
Difference	(0.012)	(0.013)	(0.017)	(0.015)	(0.019)	(0.025)
Difference in	-0.056**	-0.074***	-0.072**	-0.073**	-0.038	-0.079
Diff (DID)	(0.026)	(0.028)	(0.036)	(0.031)	(0.037)	(0.075)
Observations	29623	29623	17903	17903	11720	11720

# Table 2.10.2-1: Carer retention: Three-way interaction – Employment status -Predicted Probabilities and Marginal Effects - Probit

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

• Note for the reader: a positive figure refers to an individual's propensity to provide informal care decreasing, they are more likely to become a non-carer.

Category	Probit	Probit	Probit	Probit	Probit	Probit	
$(25^{\text{th}} \text{ and } 75^{\text{th}})$	All	All	50 & Over	50 & Over	Under 50	Under 50	
percentiles)	£706	£2097	£701	£2000	£711	£2216	
Scotland	0 451***	0 428***	0 433***	0 416***	0 476***	0 444***	
Pre Act	(0.012)	(0.012)	(0.015)	(0.014)	(0.022)	(0.018)	
TTC ACt	(0.012)	(0.012)	(0.013)	(0.014)	(0.022)	(0.010)	
Scotland	0.516***	0.531***	0.506***	0.525***	0.524***	0.535***	
Post Act	(0.020)	(0.016)	(0.022)	(0.020)	(0.040)	(0.029)	
England	0 403***	0 402***	0 382***	0 382***	0 434***	0 432***	
Pre Act	(0.006)	(0.005)	(0.006)	(0.002)	(0,009)	(0,009)	
ITEAC	(0.000)	(0.003)	(0.000)	(0.003)	(0.007)	(0.007)	
England	0.425***	0.431***	0.408***	0.407***	0.452***	0.468***	
Post Act	(0.010)	(0.010)	(0.012)	(0.011)	(0.016)	(0.015)	
Scotland	0.065***	0 103***	0 073**	0 108***	0.048	0 091***	
Difference	(0.000)	(0.020)	(0,029)	(0.025)	(0.044)	(0.034)	
Dijjerence	(0.024)	(0.020)	(0.02))	(0.023)	(0.044)	(0.034)	
England	0.022*	0.029***	0.026*	0.026*	0.018	0.037**	
Difference	(0.011)	(0.011)	(0.015)	(0.014)	(0.019)	(0.018)	
Difference in	-0.042*	-0.074***	-0.047*	-0.082***	-0.031	-0.054	
Diff (DID)	(0.023)	(0.019)	(0.028)	(0.024)	(0.044)	(0.033)	
Observations	29623	29623	17903	17903	11720	11720	

Table 2.10.2-2: Carer retention: Three-way interaction - Personal Income -Predicted Probabilities and Marginal Effects - Probit

• Note for the reader: a positive figure refers to an individual's propensity to provide informal care decreasing, they are more likely to become a non-carer.

2.10.3 Robustness checks moving the act 1 year earlier

I have also provided some robustness checks to ensure the impact of the act is presented in the results dependent of the act and not in anticipation of the act. I shall initially discuss the carer uptake results.

#### 2.10.4 Carer uptakes margins robustness checks

## Table 2.10.4-1: Carer uptake: Two-way interaction - Predicted Probabilities andMarginal Effects - Robustness - Act t-1

New carer	Logit	Probit	Logit	Probit	Logit	Probit
	All	All	50 & Over	50 & Over	Under 50	Under 50
Scotland	0.068***	0.068***	0.071***	0.071***	0.063***	0.063***
Pre Act	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Scotland	0.076***	0.076***	0.092***	0.091***	0.056***	0.056***
Post Act	(0.005)	(0.004)	(0.007)	(0.007)	(0.006)	(0.005)
England	0.065***	0.065***	0.073***	0.073***	0.054***	0.054***
Pre Act	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
England	0.082***	0.082***	0.095***	0.094***	0.065***	0.065***
Post Act	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)
Scotland	0.007	0.007	0.021***	0.020***	-0.007	-0.006
Difference	(0.005)	(0.005)	(0.008)	(0.008)	(0.007)	(0.006)
England	0.017***	0.017***	0.023***	0.022***	0.011***	0.011***
Difference	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
Difference	0.010**	0.010**	0.002	0.001	0.018***	0.018***
in Diff (DID)	(0.005)	(0.005)	(0.008)	(0.007)	(0.006)	(0.006)
Observations	165,427	165,427	73,355	73,355	92,072	92,072

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

The results in Table 2.10.4-1 are similar to those in Table 2.6.1-1. The act appears to increase uptake by 1% and nearly 2% in the younger sample, now 1.8 compared to 1.6 & 1.7.

Logit	Logit	Logit	Logit	Logit	Logit
All	All	50 & Over	50 & Over	Under 50	Under 50
Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
0.067***	0.071***	0.070***	0.071***	0.059***	0.075***
(0.004)	(0.005)	(0.006)	(0.005)	(0.004)	(0.009)
0.069***	0.086***	0.085***	0.096***	0.053***	0.063***
(0.005)	(0.007)	(0.010)	(0.009)	(0.006)	(0.013)
0.060***	0.073***	0.068***	0.076***	0.051***	0.062***
(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
0.076***	0.092***	0.092***	0.097***	0.061***	0.078***
(0.003)	(0.003)	(0.005)	(0.005)	(0.003)	(0.004)
0.002	0.015	0.015	0.025	-0.006	-0.011
(0.006)	(0.008)	(0.011)	(0.010)	(0.007)	(0.015)
0.016***	0.019***	0.024***	0.021***	0.010***	0.016***
(0.003)	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)
0.014**	0.004	0.009	-0.004	0.016**	0.027*
(0.006)	(0.008)	(0.011)	(0.010)	(0.007)	(0.016)
Probit	Probit	Probit	Probit	Probit	Probit
All	All	50 & Over	50 & Over	Under 50	Under 50
Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
0.067***	0.071***	0.071***	0.071***	0.059***	0.075***
(0.004)	(0.005)	(0.006)	(0.005)	(0.004)	(0.009)
0.069***	0.086***	0.085***	0.096***	0.053***	0.064***
(0.005)	(0.007)	(0.009)	(0.009)	(0.006)	(0.012)
0.060***	0.073***	0.068***	0.076***	0.051***	0.062***
(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
0.076***	0.091***	0.091***	0.096***	0.061***	0.078***
(0.003)	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)
0.002	0.014	0.014	0.025	-0.006	-0.011
(0.006)	(0.008)	(0.011)	(0.010)	(0.007)	(0.015)
0.016***	0.018***	0.023***	0.020***	0.010***	0.015***
(0.003)	(0.003)	(0.005)	(0.005)	(0.003)	(0.005)
0.014** (0.006)	0.003 (0.008)	0.009 (0.011) 73.255	-0.005 (0.010)	0.015** (0.007)	0.027* (0.015)
	Logit All Employed 0.067*** (0.004) 0.069*** (0.005) 0.060*** (0.002) 0.076*** (0.003) 0.016*** (0.003) 0.014** (0.004) 0.067*** (0.004) 0.069*** (0.004) 0.069*** (0.005) 0.060*** (0.005) 0.060*** (0.002) 0.076*** (0.002) 0.076*** (0.002) 0.076*** (0.002) 0.076*** (0.002) 0.076*** (0.002) 0.076*** (0.002) 0.076*** (0.002)	Logit AllLogit AllAllAllEmployedUnemployed0.067***0.071***(0.004)(0.005)0.069***0.086***(0.005)(0.007)0.060***0.073***(0.002)(0.002)0.076***0.092***(0.003)(0.003)0.076***0.092***(0.003)(0.003)0.016***0.019***(0.003)(0.008)0.016***0.019***(0.003)(0.004)0.014**0.004(0.006)(0.008)ProbitProbitAllAllEmployedUnemployed0.067***0.071***(0.004)(0.005)0.069***(0.007)0.060***0.073***(0.002)(0.002)0.076***0.091***(0.003)(0.003)0.016***0.018**(0.003)(0.003)0.016***0.018**(0.003)(0.003)0.016***0.018**(0.003)(0.003)	Logit All         Logit All         Logit S0 & Over Employed           0.067***         0.071***         0.070***           0.004)         (0.005)         (0.006)           0.069***         0.086***         0.085***           (0.005)         (0.007)         (0.010)           0.069***         0.073***         0.068***           (0.002)         (0.003)         (0.003)           0.076***         0.092***         (0.003)           0.002         0.015         0.015           0.003         (0.003)         (0.005)           0.004         0.019***         0.024***           (0.003)         (0.004)         (0.005)           0.014**         0.004         (0.009           (0.006)         (0.008)         (0.11)           Probit         Probit         Probit           All         All         50 & Over           Employed         Unemployed         Employed           0.067***         0.071***         0.071***           (0.005)         (0.007)         (0.008)           0.066***         0.073***         0.68***           (0.005)         (0.007)         (0.003)           0.0060***         0.	Logit AllLogit AllLogit S0 & Over EmployedLogit S0 & Over Unemployed $0.067^{***}$ $0.071^{***}$ $0.071^{***}$ $0.071^{***}$ $(0.004)$ $(0.005)$ $(0.006)$ $(0.005)$ $0.669^{***}$ $0.086^{***}$ $0.085^{***}$ $0.096^{***}$ $(0.005)$ $(0.007)$ $(0.010)$ $(0.009)$ $0.669^{***}$ $0.073^{***}$ $0.068^{***}$ $0.096^{***}$ $(0.002)$ $(0.002)$ $(0.003)$ $(0.003)$ $0.060^{***}$ $0.073^{***}$ $0.092^{***}$ $0.097^{***}$ $(0.003)$ $(0.003)$ $(0.003)$ $(0.003)$ $0.076^{***}$ $0.092^{***}$ $0.097^{***}$ $(0.003)$ $(0.003)$ $(0.005)$ $(0.005)$ $0.076^{***}$ $0.092^{***}$ $0.097^{***}$ $(0.003)$ $(0.003)$ $(0.005)$ $(0.005)$ $0.002$ $0.015$ $0.015$ $0.025$ $(0.003)$ $(0.003)$ $(0.005)$ $(0.005)$ $0.016^{***}$ $0.004$ $(0.005)$ $(0.005)$ $0.014^{**}$ $0.004$ $0.009$ $-0.004$ $(0.006)$ $(0.005)$ $(0.006)$ $(0.005)$ $0.067^{***}$ $0.071^{***}$ $0.071^{***}$ $0.071^{***}$ $(0.004)$ $(0.005)$ $(0.006)$ $(0.005)$ $0.069^{***}$ $0.071^{***}$ $0.071^{***}$ $0.071^{***}$ $(0.004)$ $(0.005)$ $(0.006)$ $(0.003)$ $0.067^{***}$ $0.073^{***}$ $0.068^{***}$ $0.096^{***}$ $(0.005)$	Logit AllLogit AllLogit 50 & Over EmployedLogit 50 & Over UnemployedLogit Under 50 Employed0.067***0.071***0.070***0.071***0.059***(0.004)(0.005)(0.006)(0.005)(0.004)0.069***0.086***0.085***0.096***0.053***(0.005)(0.007)(0.010)(0.009)(0.006)0.060***0.073***0.068***0.076***0.051***(0.002)(0.002)(0.003)(0.003)(0.002)0.076***0.092***0.092***0.097***0.061***(0.003)(0.003)(0.005)(0.005)(0.003)0.0020.0150.0150.025-0.006(0.003)(0.003)(0.001)(0.007)(0.007)0.016***0.019***0.021***0.010***(0.003)(0.004)(0.005)(0.005)(0.003)0.014***0.0040.009-0.004(0.007)0.014***0.0040.009(0.005)(0.004)0.016***0.071***0.071***0.071***0.053***0.069***0.086***0.085***0.096***0.053***0.004(0.005)(0.005)(0.004)(0.005)(0.004)0.066***0.071***0.071***0.071***0.071***0.014***0.007**0.068***0.068***0.053***(0.004)(0.005)(0.003)(0.005)(0.004)0.066***0.086***0.068***

Table 2.10.4-2: Carer uptake: Three-way interaction – Employment Status -Predicted Probabilities and Marginal Effects – Robustness – Act t-1

The results in Table 2.10.4-2 are again similar to those in Table 2.6.2-2 and Table 2.10.1-1. The logit results are similar at 1.4 % for the full sample and 1.6 % compared to 1.5 % and 1.7 % respectively. However now those unemployed under 50 are now 2.7% more likely to provide care. The probits are similar at 1.4 and 1.5 % compared to 1.5 and 1.6 % but again the unemployed under 50 is associated with a 2.7 % increase.

Category	Logit	Logit	Logit	Logit	Logit	Logit
$(25^{th} and 75^{th})$	All	All	50 & Over	50 & Over	Under50	Under50
percentiles)	£769	£2341	£758	£2095	£782	£2504
Scotland	0.057***	0.061***	0.064***	0.068***	0.055***	0.056***
Pre Act	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Scotland	0.063***	0.067***	0.086***	0.086***	0.043***	0.051***
Post Act	(0.005)	(0.004)	(0.008)	(0.007)	(0.005)	(0.005)
England	0.055***	0.056***	0.068***	0.067***	0.046***	0.047***
Pre Act	(0.000)	(0.001)	(0.000)	(0.007)	(0.010)	(0.01)
England	0.071***	0.072***	0.000***	0.000***	0.057***	0.050***
England De st. A st	$0.071^{***}$	$0.072^{****}$	0.089****	$0.088^{***}$	$0.057^{++++}$	$0.058^{+++}$
POST ACT	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)
Scotland	0.005***	0.005***	0.022***	0.018***	-0.011*	-0.005
Difference	(0.005)	(0.005)	(0.009)	(0.008)	(0.007)	(0.007)
England	0.016***	0.016***	0.021***	0.021***	0.011***	0.011***
Difference	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)
Difference	0.011**	0.011**	-0.001	0.003	0.023***	0.016**
in Diff (DID)	(0.005)	(0.005)	(0.008)	(0.007)	(0.007)	(0.006)
Category	Prohit	Prohit	Prohit	Prohit	Prohit	Prohit
$(25^{\text{th}} \text{ and } 75^{\text{th}})$	All	All	50 & Over	50 & Over	Under50	Under50
percentiles)	£769	£2341	£758	£2095	£782	£2504
Scotland	0.058***	0.061***	0.064***	0.068***	0.055***	0.056***
Pre Act	(0,003)	(0.001	(0.001)	(0.000)	(0.000)	(0.004)
Castland	0.0(2***	0.0((***	0.005***	0.005***	0.042***	0.051***
Scotialiu Doct Act	(0.002	(0.000	(0.007)	0.085	(0.045)	$(0.051^{\circ\circ})$
POSTACI	(0.004)	(0.004)	(0.007)	(0.006)	(0.005)	(0.005)
England	0.055***	0.056***	0.068***	0.067***	0.046***	0.047***
Pre Act	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
England	0.070***	0.071***	0.088***	0.087***	0.057***	0.058***
Post Act	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Scotland	0.004	0.005	0.021**	0.017**	-0.011*	-0.005
Difference	(0.005)	(0.005)	(0.008)	(0.007)	(0.007)	(0.006)
England	0.015***	0.016***	0.020***	0.020***	0.011***	0.011***
Difference	(0.013)	(0.010)	(0.020	(0.020)	(0.011)	(0,003)
Dijjerence	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)
Difference	0.011**	0.011**	0.001	0.002	0 0 2 2 * * *	0.01/**
	$(0.011^{m})$		-0.001	(0.003)	$(0.023^{++++})$	0.016***
	(0.005)	(0.005)	(0.008)		(0.007)	(0.006)
Observations	165,427	165,427	73,355	73,355	92,072	92,072

Table 2.10.4-3: Carer uptake: Three-way interaction – Personal Income - Predicted Probabilities and Marginal Effects – Robustness – Act t-1

The robustness checks in Table 2.10.4-3 are again similar to those in Table 2.10.1-2 and Table 2.6.3-2. These results are nearly identical.

Table 2.10.5-1: Carer Retention: Two-way interaction - Predicted Probabilities and
Marginal Effects – Robustness – Act t-1

Category	Logit	Probit	Logit	Probit	Logit	Probit
	All	All	50 & Over	50 & Over	Under 50	Under 50
Scotland	0.452***	0.452***	0.438***	0.438***	0.470***	0.470***
Pre Act	(0.011)	(0.011)	(0.015)	(0.015)	(0.020)	(0.018)
Scotland	0.460***	0.461***	0.454***	0.455***	0.466***	0.466***
Post Act	(0.014)	(0.014)	(0.016)	(0.016)	(0.029)	(0.027)
England	0.414***	0.414***	0.387***	0.387***	0.455***	0.455***
Pre Act	(0.005)	(0.005)	(0.007)	(0.006)	(0.012)	(0.010)
England	0.398***	0.398***	0.389***	0.390***	0.410***	0.410***
Post Act	(0.007)	(0.007)	(0.009)	(0.009)	(0.013)	(0.012)
Scotland	0.008	0.009	0.016	0.017	-0.004	-0.004
Difference	(0.018)	(0.019)	(0.023)	(0.023)	(0.032)	(0.032)
England	-0.016	-0.016	0.003	0.003	-0.044**	-0.045***
Difference	(0.010)	(0.010)	(0.013)	(0.013)	(0.017)	(0.017)
Difference in	-0.024	-0.024	-0.013	-0.014	-0.040	-0.040
Diff (DID)	(0.017)	(0.017)	(0.021)	(0.021)	(0.030)	(0.030)
Observations	29623	29623	17903	17903	11720	11720

Note for the reader: a positive figure refers to an individual's propensity to provide informal care decreasing, they are more likely to become a non-carer.

We are now looking at the carer retention marginal effects. For carer retention the results in Table 2.10.5-1 are very different to Table 2.6.4-2. The (DID) estimator loses all its significance and reduces from between 6 and 7 percent to between 1 and 2 percent. This would suggest the act had a very real impact when it was in place. Only once in place did the act have an effect on carer retention. This may be a result of people now being able to access support instead of people continuing until they could. However, the results don't support the concept that this was different from zero.

Category	Logit	Logit	Logit	Logit	Logit	Logit
	All	All	50 & Over	50 & Over	Under50	Under50
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Scotland	0.465***	0.436***	0.469***	0.415***	0.468***	0.478***
Pre Act	(0.015)	(0.016)	(0.023)	(0.018)	(0.022)	(0.035)
Scotland	0.453***	0.471***	0.432***	0.472***	0.473***	0.440***
Post Act	(0.017)	(0.020)	(0.021)	(0.022)	(0.032)	(0.056)
England	0.421***	0.405***	0.389***	0.385***	0.458***	0.446***
Pre Act	(0.007)	(0.007)	(0.009)	(0.008)	(0.013)	(0.016)
England	0.406***	0.388***	0.399***	0.383***	0.416***	0.397***
Post Act	(0.008)	(0.009)	(0.012)	(0.011)	(0.014)	(0.018)
Scotland	-0.012	0.035	-0.037	0.056	0.005	-0.039
Difference	(0.023)	(0.026)	(0.031)	(0.030)	(0.036)	(0.065)
England	-0.015	-0.017	0.009	-0.002	-0.042**	-0.049**
Difference	(0.012)	(0.012)	(0.016)	(0.014)	(0.018)	(0.023)
Difference in	-0.002	-0.052**	0.046	-0.059**	-0.047	-0.010
Diff (DID)	(0.022)	(0.026)	(0.031)	(0.029)	(0.034)	(0.066)
Category	Probit	Probit	Probit	Probit	Probit	Probit
	All	All	Over50	Over50	Under50	Under50
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Category Scotland Pre Act	Probit All Employed 0.465*** (0.015)	Probit All Unemployed 0.436*** (0.016)	Probit Over50 Employed 0.469*** (0.023)	Probit Over50 Unemployed 0.415*** (0.018)	Probit Under50 Employed 0.468*** (0.020)	Probit Under50 Unemployed 0.479*** (0.036)
Category Scotland Pre Act Scotland Post Act	Probit All Employed 0.465*** (0.015) 0.453*** (0.018)	Probit All Unemployed 0.436*** (0.016) 0.471*** (0.020)	Probit Over50 Employed 0.469*** (0.023) 0.432*** (0.022)	Probit Over50 Unemployed 0.415*** (0.018) 0.473*** (0.022)	Probit Under50 Employed 0.468*** (0.020) 0.473*** (0.030)	Probit Under50 Unemployed 0.479*** (0.036) 0.440*** (0.056)
Category Scotland Pre Act Scotland Post Act England Pre Act	Probit All Employed 0.465*** (0.015) 0.453*** (0.018) 0.421*** (0.007)	Probit All Unemployed 0.436*** (0.016) 0.471*** (0.020) 0.405*** (0.007)	Probit Over50 Employed 0.469*** (0.023) 0.432*** (0.022) 0.389*** (0.009)	Probit Over50 Unemployed 0.415*** (0.018) 0.473*** (0.022) 0.385*** (0.008)	Probit Under50 Employed 0.468*** (0.020) 0.473*** (0.030) 0.458*** (0.011)	Probit Under50 Unemployed 0.479*** (0.036) 0.440*** (0.056) 0.446*** (0.014)
Category Scotland Pre Act Scotland Post Act England Pre Act England Post Act	Probit All Employed 0.465*** (0.015) 0.453*** (0.018) 0.421*** (0.007) 0.406*** (0.009)	Probit All Unemployed 0.436*** (0.016) 0.471*** (0.020) 0.405*** (0.007) 0.388*** (0.009)	Probit Over50 Employed 0.469*** (0.023) 0.432*** (0.022) 0.389*** (0.009) 0.399*** (0.012)	Probit Over50 Unemployed 0.415*** (0.018) 0.473*** (0.022) 0.385*** (0.008) 0.383*** (0.011)	Probit Under50 Employed 0.468*** (0.020) 0.473*** (0.030) 0.458*** (0.011) 0.416*** (0.013)	Probit Under50 Unemployed 0.479*** (0.036) 0.440*** (0.056) 0.446*** (0.014) 0.396*** (0.017)
Category Scotland Pre Act Scotland Post Act England Pre Act England Post Act	Probit All Employed 0.465*** (0.015) 0.453*** (0.018) 0.421*** (0.007) 0.406*** (0.009)	Probit All Unemployed 0.436*** (0.016) 0.471*** (0.020) 0.405*** (0.007) 0.388*** (0.009)	Probit Over50 Employed 0.469*** (0.023) 0.432*** (0.022) 0.389*** (0.009) 0.399*** (0.012)	Probit Over50 Unemployed 0.415*** (0.018) 0.473*** (0.022) 0.385*** (0.008) 0.383*** (0.011)	Probit Under50 Employed 0.468*** (0.020) 0.473*** (0.030) 0.458*** (0.011) 0.416*** (0.013)	Probit Under50 Unemployed 0.479*** (0.036) 0.440*** (0.056) 0.446*** (0.014) 0.396*** (0.017)
Category Scotland Pre Act Scotland Post Act England Pre Act England Post Act Scotland Difference	Probit All Employed 0.465*** (0.015) 0.453*** (0.018) 0.421*** (0.007) 0.406*** (0.009) -0.012 (0.023)	Probit All Unemployed 0.436*** (0.016) 0.471*** (0.020) 0.405*** (0.007) 0.388*** (0.009) 0.035 (0.026)	Probit Over50 Employed 0.469*** (0.023) 0.432*** (0.022) 0.389*** (0.009) 0.399*** (0.012) -0.037 (0.031)	Probit Over50 Unemployed 0.415*** (0.018) 0.473*** (0.022) 0.385*** (0.008) 0.383*** (0.011) 0.058 (0.030)	Probit Under50 Employed 0.468*** (0.020) 0.473*** (0.030) 0.458*** (0.011) 0.416*** (0.013) 0.005 (0.036)	Probit Under50 Unemployed 0.479*** (0.036) 0.440*** (0.056) 0.446*** (0.014) 0.396*** (0.017) -0.039 (0.065)
Category Scotland Pre Act Scotland Post Act England Pre Act England Post Act Scotland Difference England Difference	Probit All Employed 0.465*** (0.015) 0.453*** (0.018) 0.421*** (0.007) 0.406*** (0.009) -0.012 (0.023) -0.014 (0.012)	Probit All Unemployed 0.436*** (0.016) 0.471*** (0.020) 0.405*** (0.007) 0.388*** (0.009) 0.388*** (0.009) 0.035 (0.026) -0.017 (0.012)	Probit Over50 Employed 0.469*** (0.023) 0.432*** (0.022) 0.389*** (0.009) 0.399*** (0.012) -0.037 (0.031) 0.010 (0.016)	Probit Over50 Unemployed 0.415*** (0.018) 0.473*** (0.022) 0.385*** (0.008) 0.383*** (0.0011) 0.058 (0.030) -0.002 (0.015)	Probit Under50 Employed 0.468*** (0.020) 0.473*** (0.030) 0.458*** (0.011) 0.416*** (0.013) 0.005 (0.036) -0.043** (0.018)	Probit Under50 Unemployed 0.479*** (0.036) 0.440*** (0.056) 0.446*** (0.014) 0.396*** (0.017) -0.039 (0.065) -0.049** (0.023)
Category Scotland Pre Act Scotland Post Act England Pre Act England Post Act Scotland Difference England Difference Difference in Diff (DID)	Probit All Employed 0.465*** (0.015) 0.453*** (0.018) 0.421*** (0.007) 0.406*** (0.009) -0.012 (0.023) -0.014 (0.012) -0.002 (0.022)	Probit All Unemployed 0.436*** (0.016) 0.471*** (0.020) 0.405*** (0.007) 0.388*** (0.009) 0.388*** (0.009) 0.035 (0.026) -0.017 (0.012) -0.052** (0.026)	Probit Over50 Employed 0.469*** (0.023) 0.432*** (0.022) 0.389*** (0.009) 0.399*** (0.012) -0.037 (0.031) 0.010 (0.016) 0.046 (0.031)	Probit Over50 Unemployed 0.415*** (0.018) 0.473*** (0.022) 0.385*** (0.008) 0.383*** (0.011) 0.058 (0.030) -0.002 (0.015) -0.060** (0.029)	Probit Under50 Employed 0.468*** (0.020) 0.473*** (0.030) 0.458*** (0.011) 0.416*** (0.013) 0.005 (0.036) -0.043** (0.018) -0.048 (0.034)	Probit Under50 Unemployed 0.479*** (0.036) 0.440*** (0.056) 0.446*** (0.014) 0.396*** (0.017) -0.039 (0.065) -0.049** (0.023) -0.010 (0.066)

# Table 2.10.5-2: Carer Retention: Three-way interaction – Employment Status -Predicted Probabilities and Marginal Effects – Robustness – Act t-1

Standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

• Note for the reader: a positive figure refers to an individual's propensity to provide informal care decreasing, they are more likely to become a non-carer.

Table 2.10.5-2 unlike those of Table 2.6.5-2 and Table 2.10.2-1 reports that the act prior one year did not have an impact on all those employed or the older sample.

Category	Logit	Logit	Logit	Logit	Logit	Logit
$(25^{\text{th}} \text{ and } 75^{\text{th}})$	All	All	50 & Over	50 & Over	Under 50	Under 50
percentiles)	£706	£2097	£701	£2000	£711	£2216
Scotland	0.463***	0.445***	0.445***	0.434***	0.489***	0.460***
Pre Act	(0.013)	(0.012)	(0.017)	(0.016)	(0.024)	(0.021)
Scotland	0 450***	0.460***	0 4 4 8***	0.456***	0.474***	0.464***
	(0.43)	(0.014)	(0.019)	(0.016)	(0.979)	(0.029)
FOSLACI	(0.017)	(0.014)	(0.010)	(0.010)	(0.037)	(0.020)
England	0.412***	0.415***	0.386***	0.387***	0.452***	0.457***
Pre Act	(0.006)	(0.005)	(0.007)	(0.007)	(0.013)	(0.013)
England	0.399***	0.398***	0.391***	0.389***	0.411***	0.410***
Post Act	(0.008)	(0.007)	(0.010)	(0.009)	(0.014)	(0.013)
	(0.000)	(0.000)	(0.010)	(0.000)	(0.01)	(0.010)
	0.005	0.045	0.000	0.000	0.045	0.004
Scotland Difference	-0.005	0.015	0.003	0.022	-0.015	0.004
	(0.022)	(0.019)	(0.027)	(0.023)	(0.042)	(0.033)
	-0.013	-0.017	0.005	0.002	-0.041***	-0.047***
England Dijjerence	(0.011)	(0.011)	(0.014)	(0.013)	(0.018)	(0.018)
Difforonco in Diff	0.009	0 022*	0.002	0.020	0.026	0.051*
	(0.000)	(0.033)	(0.002)	(0.020)	(0.020)	(0.031)
(עוע)	(0.021)		(0.023)		(0.041)	(0.031)
Category	Probit	Probit	Probit	Probit	Probit	Probit
$(25^{\text{th}} \text{ and } 75^{\text{th}})$	All	All	50 & Over	50 & Over	Under 50	Under 50
percentilesj	£706	£2097	£701	£2000	£711	£2216
Scotland	0.463***	0.445***	0.445***	0.433***	0.489***	0.460***
Pre Act	(0.013)	(0.012)	(0.017)	(0.016)	(0.022)	(0.019)
Scotland	0 459***	0 461***	0 449***	0 456***	0 474***	0 464***
Post Act	(0.017)	(0.014)	(0.018)	(0.016)	(0.036)	(0.026)
	(0.01)					
England	0.412***	0.415***	0.386***	0.387***	0.452***	0.457***
Pre Act	(0.006)	(0.005)	(0.007)	(0.007)	(0.011)	(0.010)
England	0.399***	0.398***	0.391***	0.389***	0.410***	0.410***
Post Act	(0.008)	(0.007)	(0.010)	(0.009)	(0.013)	(0.012)
	-0.004	0.016	0.004	0.022	-0.015	0.004
Scotland Difference	(0.004)	(0.010)	(0.004)	(0.023	(0.013)	(0.004
	(0.022)	(0.019)	(0.027)	(0.023)	(0.042)	(0.033)
England Difference	-0.012	-0.017	0.005	0.002	-0.041**	-0.047***
	(0.011)	(0.011)	(0.014)	(0.013)	(0.018)	(0.017)
Difference in Diff	-0.009	-0.032*	0.001	-0.021	-0.026	-0.051*
(DID)	(0.021)	(0.017)	(0.025)	(0.021)	(0.040)	(0.030)
Observations	20622	20622	17002	17002	11720	11720
	29023	29023	1/903	1/905	11/20	11/20

Table 2.10.5-3: Carer retention: Three-way interaction – Personal Income -Predicted Probabilities and Marginal Effects – Robustness – Act t-1

• Note for the reader: a positive figure refers to an individual's propensity to provide informal care decreasing, they are more likely to become a non-carer.

## End of Chapter Two

## 3 Chapter Three: An ex-post analysis of providing informal care in middle adolescence. The implications in adulthood.

### 3.1 Abstract

The UK is home to millions of informal carers, with a substantial body of literature focused on adult caregivers. However, as demand for care increases across society, the financial difficulties faced by many families, coupled with the decline of nuclear family structures, the high cost, and the limited availability of formal care services, indicate that the involvement of young people spanning from children to adolescents—in informal caregiving is likely to increase. The literature on young carers has traditionally encompassed individuals up to the age of 29, but this paper narrows its focus to young (middle adolescent) carers between the ages of 14 and 16. It accomplishes this by applying statistical analysis to data from the English focused Next Steps dataset (previously the Longitudinal Study of Young People in England (LSYPE)). Comparing the employment and earnings outcomes of middle adolescent carers and non-carers in the future at the age of 25. A key challenge is the potential for selection bias, as young carers are likely to differ systematically from non-carers. For example, children from lower-income families may provide caregiving due to financial and resource constraints, which also limits their educational and job opportunities, making it seem as though caregiving itself causes poorer employment outcomes, when underlying household resources are driving both the caregiving role and employment challenges. To address this issue, I employ a Propensity Score Matching (PSM) approach to reduce selection bias, by comparing the outcomes of middle adolescent carers across caring iterations to those of a matched sample of non-carers with similar observable characteristics. My findings suggest that while young carers face initial employment barriers, their earnings potential postemployment remains unaffected. Dependent on caring history separated for (1, 2, >1 and 3 sweeps) I find that middle adolescent carers are between 2.9 and 14.9 % less likely to have gained employment by the age of 25, 4 – 17.6% less likely to be employed at 25 and between 3.8 and 14.3% less likely to be economically active at 25, compared to non-carers. However, employment and being economically active at 20 and earnings at the age of 25 appear to be unaffected. These findings underscore the need for targeted support and policy interventions, which may involve re-evaluating the acceptability and sustainability of young people's involvement in care. The difference between carers and non-carers is apparent by aged 20 & aged 25, future research should extend this analysis into the 30's.
# 3.2 Introduction

Research on informal carers has primarily focused on older adults, spouses, and workingage adults. This research has systematically identified the negative effects experienced by those who provide informal care. These included depressed earnings, lower employment rates, poorer mental health, and an increased likelihood of exiting the labour market (Casado-Marín, García-Gómez and López-Nicolás 2010; Heitmueller and Inglis 2007; Van Houtven, Coe and Skira 2013). These papers paint a very bleak picture for the sustainability and long-term viability of informal care.

The demand for informal and social care in general has increased and will continue to do so as people live longer, survival improves across all conditions and as medicine provides extended years for previously fatal or life shortening diseases. We already understand the vast majority of social care is provided by unpaid carers across the globe (Coe and Werner, 2022) ( in addition see chapter 1 of this thesis). An often-overlooked group in the literature is young carers who are likely to face increased demands on their caregiving roles as nuclear families decline and more adults are required to work due to rising living costs and financial pressures on households. However, estimates of their numbers vary widely and as such figures should be interpreted with caution. Cheung, McKeown and Shah (2020) estimate approximately 500,000 people under the age of 25 provide unpaid care. According to the Office for national statistics (ONS) (2023) England had over 120,000 unpaid carers aged between 5 and 17 years old according to the data they used. For secondary school age children, The BBC and Nottingham University estimate that 7% of children aged 11 to 15 years old provide care (Kendall, 2021). These are significant numbers but at what individual cost?

These critical developmental stages play a significant role in later life trajectories (Parvin *et al.* 2024). Young carers are at a heightened risk of disengagement from education (Kaiser and Schulze, 2015), society (Rose and Cohen, 2010), experience increasing levels of deprivation (Alexander, 2021) and poorer mental health (Robison, Inglis and Egan, 2020a). It is likely the emotional pressure extends into the labour market (Lacey, Xue and McMunn, 2022 and Wang, Frank and Glied 2023). Unlike adults, young carers in particular often have limited agency in their roles, with few opportunities to relinquish these responsibilities, underscoring the critical need for adequate support. Regardless of the support provided, these roles may have enduring consequences. Golm *et al.* (2020)

highlight that early life experiences can predict the need for services, interventions, and social deprivation in adulthood. Such deprivation has been shown to adversely affect mental health and cognitive development (Orben, Tomova and Blakemore, 2020). Additionally, Mayhew, Harper and Villegas (2020) link early-life deprivation to long-term effects on life expectancy and health, underscoring the economic importance of addressing the implications of caregiving during middle adolescence.

My study will compare the likelihood of employment by the age of 25, the likelihood of economic activity at 20 and 25 and average earnings between young carers and those who didn't provide care. By understanding the impact providing informal care as a child, we can fully appreciate the costs borne by these children and inform policy decisions and support. This research utilises statistical analysis on the British longitudinal Nextsteps<sup>3</sup> Dataset, following a single cohort of children into adulthood. The dataset follows the same cohort of children from 14 years old into adulthood and continues to this day. In reviewing the samples, carers and non-carers exhibit different characteristics surrounding their family and household, which is likely to determine both caring responsibilities while at young age and future employment outcomes in adulthood. In general, these comparisons suggest that households with young carers tend to exhibit socioeconomic characteristics associated with worse employment outcomes, compared to households without young carers. As a result, simple comparisons between the two groups would result in negatively biased estimates for the causal impacts of providing such care at young age on their future outcomes. Carers have also been separated dependent on their caring intensity. The rationale behind this is that a temporary one sweep (year) period of care is likely to have less impact than someone who provides care for three years during the ages of 14 to 16.

In an attempt to address the issue of selection bias, this study employs a two-stage Propensity Score Matching (PSM) approach. In the first stage, a Probit or Logit model is used to regress a binary variable, indicating whether a young person provides care or not, on a range of observable characteristics, such as household income, education, and other demographic and socioeconomic factors. Based on these estimates, a propensity score –

<sup>&</sup>lt;sup>3</sup> University College London, UCL Institute of Education, Centre for Longitudinal Studies. (2024). Next Steps: Sweeps 1-9, 2004-2023. [data collection]. 17th Edition. UK Data Service. SN: 5545, DOI: http://doi.org/10.5255/UKDA-SN-5545-9

the estimated probability of being a young carer – is calculated for each individual in the sample. This score is then used to match each young carer to one or more young noncarers with a similar propensity score, depending on the matching approach adopted. The underlying rationale is that individuals with similar propensity scores will have similar observable characteristics. In the second stage, the difference in the outcome of interest is calculated for each matched pair. The average of these differences across all matched pairs provides an estimate of the average effect of providing care on the outcome of interest, conditional on having similar observable characteristics.

Note that the quality and robustness of the results depend on the matching quality and matching criteria. Poor overlap in propensity score distribution and unmeasured confounders could still bias the estimates. For example, even after controlling for the observable differences between the two groups, if selection into providing care is still dependent on unobservable affect the outcomes of interest, then the second stage estimates would still be biased. It also depends on the presence of a sufficient number of untreated individuals who share similar characteristics with those providing care, assuming that any differences between the groups are not substantial and that sufficient individuals exhibit key similarities.

My approach has the advantage of using a dataset that follows the same children from the age of 14 to adulthood crossing significant stages in life together. This cohort study reduces confounding by factoring caring at different and distinct ages, controls time related factors that are shared across the cohort, provides clearer longitudinal analysis and allows direct comparisons across life stages. As a result, the combination of using this data with a PSM modelling approach, addresses issues in prior literature. Notably, Brimblecombe *et al.* (2020) failed to incorporate the household demographics and characteristics in its results, impeding the full understanding of those providing care, ignoring the selection bias into caring and how these factors will impact these individuals in adulthood. Similarly, Xue *et al.* (2023) combined individuals aged 16 to 29 in their analysis, failing to distinguish the varying life stages in their analysis and failing to deal with the potential bias in the difference between carers and non-carers.

The findings presented in this paper indicate a complex relationship between caregiving and employment. I find that dependent on caring iteration/intensity, carers are between

2.9 and 14.9 % less likely to have gained employment by the age of 25, 4 – 17.6% less likely to be employed at the age of 25 and between 3.8 and 14.3 % less likely to be economically active at 25. While various patterns of young caregiving emerge, there is a discernible link between being a young carer and never having been employed by the age of 25. Barriers to entering the labour market likely include disengagement from society, mental health challenges, financial constraints, and lower school attainment. However, once these barriers are overcome, a history of caregiving does not appear to adversely affect earnings among those who are employed. In fact, the skills and experiences gained through caregiving may contribute positively to early career development. There is also an apparent trend developing where employment is not impacted by the age of 20 but does appear to be impacted by the age of 25. Further research will be required to extend this analysis once data becomes available to follow individuals into their 30's.

This paper contributes to the literature by recognising the barriers to employment faced by many young people but this paper is only the beginning to understanding a complex and comprehensive analysis of young carers and the long-term impacts. Policymakers could consider legislating against the involvement of young carers, particularly those under the age of 18 or 16. One approach to achieving this would be to remove children from caregiving situations, although this measure may be viewed as extreme. A more viable solution, however, might involve the provision of comprehensive and prioritised care packages, along with adequate funding, which would reduce or eliminate the need for children to assume caregiving responsibilities. This would enable children to focus on their developmental needs. However, the allocation of significant resources and support could be ineffective if young carers are unable to access these services. Therefore, targeted support and resources would only be effective in situations where formal caregiving arrangements replace the caregiving duties currently performed by children.

The structure of this paper is as follows, the next section, 3.3 provides an overview of the impact of providing care as a young person. Section 3.4 provides an overview of the survey, the sample of individuals used in the analysis, descriptive statistics on the differences between carers and non-carers and further explanations on the usefulness of the PSM approach. Following this, in sections 3.5 and 3.7 I provide the results for the econometric analysis and present robustness checks to investigate the validity of the results. This paper concludes with 3.8, a discussion on policy and interventions.

# 3.3 Literature Review: How caring impacts children's economic outcomes

The vast majority of young carers are in lone parent households (Clay *et al.*, 2016), where poverty and deprivation is high. A link between childhood poverty and the negative effects experienced in adulthood is well documented (Chetty *et al.* 2016b). Child development is also shaped by their upbringing, which can confer both advantages and disadvantages. Generational transfers occur across socioeconomic, health, and social dimensions (Case, Lubotsky and Paxson, 2002; Heckman, Pinto and Savelyev, 2013; Chetty *et al.* 2016 and Akee *et al.* 2018). These generational transfers include disadvantages such as poverty, health and narrow social networks (Almquist, 2016; Almquist and Brännström, 2018; Case, Fertig and Paxson, 2005). These transfers from parents to children also includes development, human capital, social networks and include influence.

Wealthier households, by contrast, offer more resources, greater human capital, and broader networks, all of which foster higher achievement (Chetty *et al.* 2014, Weinberg, 2001 and Dearden, Ferri and Meghir, 2002). Early employment outcomes are particularly linked to household resources and parental characteristics (Caspi *et al.* 1998). The lack of employment experience, compounded by minimal interaction with employed individuals, hinders human capital development, narrows social networks, and limits opportunities, often perpetuating cycles of poverty. Additionally, the intergenerational transmission of welfare reliance further reduces employment-seeking behaviours, influenced by both situational effects and reduced motivation in welfare-dependent environments (Dahl, Kostøl and Mogstad, 2014).

Parental health also influences the development of cognitive and non-cognitive skills (Le and Nguyen, 2017). These cognitive skills, vital for acquiring knowledge and problemsolving, have been linked positively to economic and non-economic outcomes (Burks *et al.* 2009, Hanushek and Woessmann, 2012 and Cunha and Heckman, 2008). Conversely, non-cognitive skills, encompassing attitudes and behaviours, play a crucial role in influencing earnings, employment, and further education attainment (Heckman, Pinto and Savelyev, 2013 and Heckman and Kautz, 2012). Parental education also shapes childhood development, with the absence of work leading to a decline in human capital transfer across generations (Dickson, Gregg and Robinson, 2016).

The caregiving responsibilities themselves impose direct costs. Time conflicts inherent in caregiving reduce educational attainment across secondary, post-secondary, and tertiary levels (Xue *et al.* 2023). In addition to these concerns, Clark and Royer (2013) and Corak (2013) identified how lower educational attainment is linked to lower health outcomes in adulthood. Employment during early adulthood is critical, as unemployment during this period has lasting adverse effects on both individuals and society (Bell and Blanchflower, 2011).

Young carers also bear a heavy emotional and physical burden. Two systematic reviews by Lacey, Xue and McMunn (2022) and Fleitas Alfonzo *et al.* (2022) provide extensive evidence of young carers and their poorer mental and physical health, worsened by their age and lack of timely institutional support. This gap in support is further permeated because of the lack of awareness or identification of young carers. Joseph *et al.* (2020) alluded to the veil of secrecy that develops in situations where children are providing care. Shame and fear keep these children hidden, preventing them from accessing essential support services. Roling *et al.* (2020) found the mental health was lower and the connection with society damaged in those adults who provided care in childhood. Poorer mental health can lead to people leaving the labour market and indeed not engaging with employment. Requiring healthcare support and intervention for many years post incident. Continuing with Roling *et al.* (2020), their review also identified young carers had less time to socialise with friends alienating them from key moments growing up.

A consequence of poor mental health in childhood is also likely to persist into early adulthood, impacting engagement with employment, further education and requiring further support from the state than their non caring counterparts. This was identified by Wiegand-Grefe *et al.* (2019) and Bratti and Mendola (2014), who revealed the deleterious impact of parental mental illness on children. These scenarios exhibited diminished family function, altered structural dynamics, and heightened conflict. This missing correlation positively associated with a child's sense of societal membership, potentially fosters detachment from conventional institutions and an augmented predisposition to exhibit signs of compromised mental health, deprivation and suffering. With a

compromised parental dynamic there is likely to be a lower human capital transfer between parents and children.

The broader costs of poor education—such as reduced earnings, lower occupational class, poorer health, and greater reliance on state support—are well-documented (Crosnoe, 2006; Heckman, 2011; Henry, Knight and Thornberry, 2012; Cullen *et al.* 2013; Fletcher, 2013; Kirk and Sampson, 2013; Liu, Lee and Gershenson, 2021; Silliman and Virtanen, 2022). While this study does not address academic dropout directly, it highlights that the educational disruptions caused by caregiving are likely to be one of the most significant contributors to the long-term costs borne by young carers and society.

## 3.4 Data and methodology

#### 3.4.1 The Dataset

The English Next Steps Longitudinal Dataset (NSD) is a comprehensive English focused longitudinal cohort study. Employing a longitudinal approach following the same original cohort, this study captures data from individuals across multiple sweeps/waves (sweeps and waves will be used interchangeably), enabling researchers to examine social and economic circumstances over an extended period. The survey encompasses questions relating to health, family dynamics, finances, education, aspirations and biological information. For this survey, only the publicly available information at the UK Data Service was accessed in accordance with the research topic of this study. The first sweep of NSD took place in 1989 and 1990, surveying 14-year-olds based in England, and then following them annually until they turned 20 years old. The most recent sweep used here (sweep 8) corresponds to these individual at aged 25. The continuity of the NSD into subsequent sweeps affords the prospect of prolonged analysis, potentially extending into the subjects' 30s or 40s, although consideration of a more frequent survey cadence is imperative for future research directions this topic could be returned to in the future to update the analysis.

The NSD survey has been picked over other publicly available surveys, like the UK household longitudinal survey (UKHLS), for several reasons, the main being the middle adolescent sample size and subsequent early adulthood sample. UKHLS is tasked with getting a population sample that is reflective across all ages. In contrast, the NSD was only focused on getting a sample on those in middle adolescence at aged 14. As a result, the UKHLS sample would be smaller and then differing policies or time varying effects would have to be considered. As the NSD is based only in England, where the travel in policy over time is consistent across the sample, the findings can be generalised over the broad population. Another area the NSD excels is its focus on the transitions between life stages. It is exceptionally focused on the distinct ages of those involved in contrast to the broad spectrum of the UKHLS. This provides a larger potential sample. The NSD has been used across different academic frontiers, in particular education and employment. These have included examining the impact of schools on subject choice (Anders *et al.*, 2018), education policy (Rizzica, 2019) and youth employment (Holford, 2020).

#### 3.4.2 Propensity score matching (PSM)

In seeking to determine the impact of being a carer in middle adolescence on early adulthood outcomes we have to acknowledge there may be selection bias into the treatment group. In this situation there are clear differences between children who provide care and those that do not. A simple regression model would provide a biased estimator of the effect of being a carer. For example, they may have a disabled parent, live in a single parent household, poverty or may have underlying medical conditions themselves. Which in later life would also impact employment, earnings, and economic activity. Therefore, failing to properly account for these pre-existing differences would incorrectly attribute differences in later life outcomes to being a carer rather than the underlying differences. A different approach is required to address these differences.

Propensity Score Matching (PSM) is a statistical technique used in observational studies to estimate the causal impact of a treatment or intervention by matching individuals in a treated group with those in a control group based on their propensity scores. These scores represent the probability of receiving the treatment (being a carer), conditional on their observed characteristics. By creating matched pairs, PSM aims to minimise selection bias, allowing for a more accurate comparison of outcomes between the groups and enhancing the validity of causal inferences. The technique was largely the invention of Rosenbaum and Rubin (1983), with further papers by Rosenbaum and Rubin (1984, 1985) cementing the techniques importance.

In the first stage I use a probit model to regress the binary caring variables Table 3.4.7-1 on a range of observable characteristics presented in Table 3.4.3-1. This estimates a propensity score, the probability of being a carer, for each individual. *Please note the caring scores will change depending on the iteration of care being provided this will be further explained in subsequent sections.* This propensity score is then subsequently used to match each carer to one or more non-carers with a similar propensity score. Underlying this approach is that individuals with similar scores will have similar observable characteristics, isolating the impact of caring. In the second stage of (PSM) the differences in the outcome for example (ever employed) is calculated for each matched pair or pairings depending on approach. The average of these differences across all matched pairs or pairings provides an estimate of the (ATT) average effect of the

treatment on those treated. In this case this will be the average effect of being a young carer dependent on them being a young carer.

There are several assumptions that are central to using (PSM). These include conditional independence assumption, that given a set of observable covariates X which are not affected by treatment, potential outcomes are independent of treatment assignment. This implies, that selection is solely based on observable characteristics and that all variables that influence treatment assignment and potential outcomes simultaneously are observed by the researcher. Another assumption is overlap (common support); this rules out the phenomenon of perfect predictability of the treatment given the covariates in X. This simply means that individuals with similar characteristics have a positive probability of being both participant and non-participants in the treatment. Matching quality is also another assumption that is key to the results and their interpretability, this means the covariates and their values should be balanced between those treated and not treated after matching. If these values are wildly different then the estimator (ATT) will not reflect the true impact of the treatment.

Matching quality in Propensity Score Matching (PSM) refers to the degree to which the covariates (variables used to estimate the propensity score) are balanced between the treated and control groups after matching. The aim of matching is to pair treated individuals (carers) with untreated individuals (non-carers) who have similar values for the covariates, making the two comparable. When matching quality is high, the distribution of covariates in both groups will be similar, meaning the treatment and control groups will be alike in terms of the factors that could influence the outcomes. This balance reduces the risk of bias in estimating the treatment effect. Poor matching quality, however, can lead to significant imbalances in covariates between the groups, undermining the validity of the matching process and potentially resulting in biased or misleading conclusions about the treatment's effect. Good quality matching would mean that the differences in means in the matched sample are smaller and less statistically significant, compared to the differences between the samples before matching took place. For example, a perfectly balanced matched sample would result in all mean differences being close to 0 and are all highly insignificant. However, this is a theoretical perfectionism that does not exist in the real world, where perfectly matching samples becomes trickier with the addition of more covariates and where there is no overlap (common support) in some regions of the propensity score. This approach is also dependent on the fact that once we include all observable characteristics in the models that there are no other unobservable determinants of employment or likelihood to provide care that differ between the treated and untreated samples. That is, holding all these characteristics fixed, people in the control and treatment group are very similar in terms of all possible factors that affect employment/earning, even if these are unobserved (e.g. in the matched sample, people have the same innate ability, same motivation, etc). This is where (PSM) is based on "selection on observables assumption". If selection depends on further observables, then biases would remain and alternative "selection on unobservable" methods would be required such as instrumental variables method.

There are several different matching approaches to attain a good quality match. Several matching approaches are available to pair treated and control units based on their propensity scores, each with its advantages. Nearest Neighbour Matching pairs each treated unit with the closest control unit based on propensity score, with options for matching one or more individuals (k-nearest neighbours). Radius Matching matches treated units to control units whose propensity scores fall within a specified radius (caliper) from the treated unit's score, ensuring that matches are not too far apart. Kernel Matching uses a weighted average of all control units within a kernel function, where weights are based on the distance between the propensity scores, providing smoother matching that accounts for the entire control group rather than just one or a few units. Stratification Matching divides the range of propensity scores into strata (subgroups) and matches treated and control units within the same stratum, allowing for more flexible comparisons across different levels of treatment likelihood. These methods differ in how they handle the trade-off between precision in matching and the number of available control units, with some offering more control over the quality of matches (e.g., nearest neighbour or radius) and others being more flexible and inclusive (e.g., kernel or stratification).

#### 3.4.3 Variables

Variable	Values	Household characteristics takes maximum value across sweeps 1 to 3
Adults0	0, 1	Indicator for no additional adults in the household other than parents
Adults1	0, 1	Indicator for one additional adult in the household other than parents
Adults2or3	0, 1	Indicator for two or three additional adults in the household other than parents
Degfemale	0, 1	Indicates if the female parent has a degree at any time $(1 = \text{Yes}, 0 = \text{No})$
Degmale	0, 1	Indicates if the male parent has a degree at any time $(1 = \text{Yes}, 0 = \text{No})$
Fd	0, 1	Indicates whether the female parent is disabled at any time $(1 = \text{Yes}, 0 = \text{No})$
Md	0, 1	Indicates whether the male parent is disabled at any time $(1 = \text{Yes}, 0 = \text{No})$
Kids0	0, 1	Indicator for no additional children in the household
Kids1	0, 1	Indicator for one additional child in the household
Kids2	0, 1	Indicator for two additional children in the household
Kids3or4	0, 1	Indicator for three or more additional children in the household
Male	0, 1	Gender indicator for male $(1 = Male, 0 = Female)$
	Pare	ental occupation takes maximum value across sweeps 1 to 3
Mfp1	0, 1	Indicator for NO female parent in Household $(1 = Yes, 0 = No)$
Mfp2	0, 1	Female parent unemployed $(1 = \text{Yes}, 0 = \text{No})$
Mfp3	0, 1	Female parent in unskilled occupation $(1 = \text{Yes}, 0 = \text{No})$
Mfp5	0, 1	Female parent in professional or skilled occupation $(1 = \text{Yes}, 0 = \text{No})$
Mmp1	0, 1	Indicator for NO male parent in Household $(1 = \text{Yes}, 0 = \text{No})$
Mmp2	0, 1	Male parent unemployed $(1 = \text{Yes}, 0 = \text{No})$
Mmp3	0, 1	Male parent unskilled $(1 = \text{Yes}, 0 = \text{No})$
Mmp4	0, 1	Male parent Skilled trade $(1 = \text{Yes}, 0 = \text{No})$
Mmp5	0, 1	Male parent professional $(1 = \text{Yes}, 0 = \text{No})$
	Hous	ehold income takes the maximum value across sweeps 1 to 3
Maxhhinctab1	0, 1	Household income group 1 (1 = income below £20,800)
Maxhhinctab2	0, 1	Household income group 2 (1 = income above maxhhinctab1 but below $\pounds 36,400$ )
Maxhhinctab3	0, 1	Household income group 3 ( $1 =$ income above £36,400)
		Outcome variables
Everemp	0, 1	Indicates if the individual has ever been employed by age 25 $(1 = \text{Yes}, 0 = \text{No})$
Logannual		Log annual income from employment
Wave7	0, 1	In paid employment at wave 7 $(1 = \text{Yes}, 0 = \text{No})$
Wave7active	0, 1	In paid employment or education at wave 7 $(1 = \text{Yes}, 0 = \text{No})$
Wave8	0, 1	In paid employment at wave 8 $(1 = \text{Yes}, 0 = \text{No})$
Wave8active	0, 1	In paid employment or education at wave 8 $(1 = \text{Yes}, 0 = \text{No})$

## Table 3.4.3-1: Variable descriptions<sup>4</sup>

The original dataset consisted of 90,167 records for 16,122 unique individuals. I kept in the sample only those individuals who were present for all of the waves. As a result of missing information in some of the variable, this was further reduced to only include

<sup>&</sup>lt;sup>4</sup> Female and male parent have been used to identify the adult who is considered either the mother or stepmother/carer or main adult of each gender. This follows the information provided by the dataset.

individuals who had a complete set of responses to the variables in Table 3.4.3-1. The final sample of 3,345 unique individuals contains approximately 10% of carers, which is higher than the 5% in the original dataset. This is beneficial as there are more carers to be matched too.

The variables used in this paper, detailed in Table 3.4.3-1., are derived from the original dataset, and the majority are designed to capture the maximum value across three waves, corresponding to when individuals were 14, 15, and 16 years old. This approach is informed by the methodology's focus on long-term effects, particularly the impact of parental characteristics on employment in later waves. For example, the variable "Female parent unemployed" is coded as a 1 if the female parents highest value across the original surveys occupation responses at sweeps 1, 2 and 3 was unemployed, i.e. they were not employed during the first 3 sweeps/waves. The parental occupation categories are ordered from lowest to highest as unemployed, unskilled, skilled, and professional, with skilled and professional occupations combined for the female parent due to sample size constraints. Parental occupation movement between these categories was found to be minimal in preliminary analysis.

Please note a shift to employment or a higher value category for example to female parent unskilled at any point would supersede the unemployment status and become coded 0 with the relevant new parental occupation becoming a 1.

Parental characteristics such as occupation, health, education, and household income are included in the model because they are crucial factors in the likelihood of an individual providing care. Larger households with more adults may be associated with the need for care, this is evident in our non-caring and anytime carer sample in Table 3.4.8-1. Where carers are associated with higher numbers of additional adults and siblings. The variable for siblings includes all siblings in the household, regardless of age, while the variable for additional adults includes any non-sibling adults, such as grandparents, aunts, or family friends. This methodology ensures a comprehensive understanding of the family structure and socio-economic dynamics that influence caregiving and employment outcomes.

Parental health is also a significant indicator of the probability of caregiving. Additionally, education and household income are essential for understanding movements into employment and socio-economic success (Erola, Jalonen, and Lehti, 2016). The household income variable use the highest value from the income question asked in Sweeps 1 and 3, as income was only measured in these waves. The binary variables for parental degree-level education capture whether a household has a high level of education, further refining the socio-economic profile of the household. Table 3.4.8-1 highlights that carers come from poorer households and have parents in lower skilled and unemployed occupations.

Finally, the variable for siblings includes all siblings in the household, regardless of age, while the variable for additional adults includes any non-sibling adults, such as grandparents, aunts, or family friends. This methodology ensures a comprehensive understanding of the family structure and socio-economic dynamics that influence caregiving and employment outcomes.

#### 3.4.4 The influence on being a carer

The need for care in a household can be influenced by various factors related to family structure, parental education, employment status, and income. Household composition is one key element; the number of additional adults or children in the home can directly impact caregiving responsibilities. Families with no additional adults (represented by the variable adults0) or those with more children, especially with three or more (as indicated by kids3or4), may face a higher caregiving burden, as there is less external support and more children to care for. Households with more adults can indicate these adults are in that household because they require care.

Parental factors, such as education, employment, and disability status, also contribute significantly to the caregiving dynamics. Parents with higher education levels (degfemale, degmale) may have better employment opportunities and the potential for flexible work schedules, which could reduce the strain of caregiving and the need for external support. These are also linked with healthier outcomes and better resources to improve health. On the other hand, parents who are unemployed (mfp2, mmp2) or disabled (fd, md) may face increased caregiving needs, either because they are unable to work or because their disability makes it harder for them to provide care for their children or other family members. Additionally, the presence of professional or skilled parents (mfp5, mmp5, mmp4) may influence the caregiving structure. Such parents might have the financial resources to hire external caregivers or afford childcare, reducing the caregiving burden

at home. However, their demanding jobs might also limit their availability, creating a complex balance between providing care and maintaining professional responsibilities.

Finally, household income is another major factor affecting caregiving needs. Families with lower income (maxhhinctab1) may struggle to provide the necessary care, either due to financial constraints or limited access to external caregiving resources. In such households, there may be a greater reliance on familial caregiving, either from parents or extended family members. Households may indeed be poorer because they include unemployed adults who cannot work and therefore poverty may be an issue. Higherincome households (maxhhinctab3) are typically better equipped to manage caregiving responsibilities, often through outsourcing care or creating a more supportive caregiving environment at home. These families may have more flexibility to ensure that both parental and caregiving needs are met, further reducing the strain on the family unit. There is also a relationship between health and income. We may expect those with better health to be wealthier and those households are wealthier can increase their spending on fresh ingredients and healthcare. In summary, caregiving needs are shaped by a complex interplay of household structure, parental characteristics, and financial resources, with various factors either increasing or alleviating the burden of care in different family contexts.

#### 3.4.5 The influence on economic outcomes

The variables in Table 3.4.3-1., have substantial implications for a young person's economic outcomes, influencing their potential for employment, earnings, and educational attainment in several ways.

Household composition, particularly the presence of additional adults and children, has a direct impact on a young person's ability to focus on education and employment. For example, if a young person lives in a household with multiple children (kids3or4) or a limited number of additional adults (adults0), they may face greater household demands, reducing the time or resources available for their own educational pursuits. However, in households with fewer adult members or high caregiving demands, young people may have to prioritise caregiving duties over their own education or job-seeking efforts, potentially leading to lower educational attainment or delays in entering the workforce. There is also an element of familiarity. If a child is having to provide care, they may be less attached to society and the concept of employment is alienating. Parental education levels play a significant role in shaping a young person. A young person with parents who have higher educational attainment (degfemale, degmale) is more likely to be encouraged to pursue higher education or vocational training, which can result in better employment prospects and higher earnings. These parents are also more likely to provide educational resources, such as books, tutoring, and a conducive learning environment, which enhances the young person's ability to perform well in school. Having more resources and social networks to seek employment and working opportunities will be better in well-resourced households. In contrast, young people with parents who have lower educational levels may face more barriers to educational success, as their parents might lack the knowledge or resources to support their academic pursuits, which in turn limits their employment opportunities and potential earnings in the future. They may also not have the time or knowledge to gain employment.

Disability status is another crucial factor. If a young person's parent is disabled (fd, md), the young person may be required to take on caregiving responsibilities, limiting their ability to focus on their education or career development. Moreover, the financial strain from having a disabled parent could limit the young person's access to opportunities, such as higher education or skill-building programs, further restricting their earning capacity and economic mobility.

Parental employment status is also a key influence on a young person's economic output. If the young person's parent is unemployed (mfp2, mmp2), this may lead to financial instability within the household, potentially affecting the young person's ability to continue their education or enter the workforce. Without stable income, families may not be able to support educational expenses, such as tuition, books, or extracurricular activities, which could hinder the young person's parents are employed in higher-paying or skilled occupations (mfp5, mmp5), the family is more likely to have the financial resources to invest in the young person's education, giving them the opportunity to attend higher education or secure higher-paying jobs, thereby boosting their long-term economic outcomes.

Household income plays a major role in determining the opportunities available to a young person. Families with higher incomes (maxhhinctab3) can afford to invest in children. All of which significantly enhance the young person's chances of attaining higher

educational qualifications and securing well-paying employment. High-income families are also more likely to have networks and connections that can help the young person secure internships, mentorships, or job opportunities. In contrast, lower-income families (maxhhinctab1) often face financial constraints that limit access to education or training, which can directly impact the young person's ability to secure well-paying employment later on. These financial constraints can also lead to a reliance on part-time or low-wage jobs during education, which may hinder academic performance and delay the young person's entry into higher-paying career paths.

In summary, the economic outcomes of a young person—whether in terms of employment, earnings, or educational attainment—are profoundly influenced by their household composition, parental education and employment status, and household income. These factors shape both the resources available to the young person and the opportunities they can pursue. For young people in households with fewer resources or greater caregiving demands, the road to economic independence may be more challenging, potentially leading to lower educational attainment, limited employment opportunities, and lower lifetime earnings. Conversely, young people with access to supportive and resource-rich environments are more likely to succeed academically and professionally, enhancing their economic output and upward mobility.

#### 3.4.6 The outcome variables

The focus of this paper is employment and earnings. The aim of this paper is to determine the medium impact from providing care in middle adolescence into early adulthood. Xue *et al.* (2023) and Brimblecombe *et al.* (2020) have already focused on more current employment transitions. This has also been performed in adult informal carers (Heitmueller, 2007). However, the justification for this depends on timing alone with different periods of caring corresponding to different ages of the individual. In my paper I am accounting for long term effects of providing care (persistent impact) by focusing on one cohort. Moving through life's stages together aids analysis. In addition to employment this paper also analysis the impact of caregiving on earnings. This was missing from Xue *et al.* (2023) but was included in Brimblecombe *et al.* (2020). Initial barriers to entry may be overcome but the impact on earnings is also important.

I have included 7 outcome variables that are justifiable, which are:

*Everemployed by the age of 25 (everemp):* This accounts for the barrier to employment. Consider the situation of a young carer, who is living in poverty with no role models at home who are employed, where no one is pushing them to gain employment or even seek it out. Completely disassociated with society just trying to survive on social welfare or the finances at home. They may not have the resources to seek out employment, issues with resources include travel, experience, education and a social network that provides their own unique issues and pressures to dissuade from gaining employment.

*In paid employment at the age of 20 (Wave 7):* This accounts for the current employment status only at age 20. Checking employment status at 20 years old provides us with some early adulthood employment information and whether there remains a barrier to employment at this age and a harm to social mobility. At this age many young people have finished their education or even coming to the end of their tertiary education. This will also allow analysis to be performed to determine if there are barriers at 20 years old.

In paid employment at the age of 25 (Wave 8): This accounts for the current employment status only at age 25. Checking employment status at 25 years old provides us with some early adulthood employment information and whether there remains a barrier to employment at this age and a harm to social mobility. At this age many young people have finished their education and would have completed their education in the tertiary sector seeking employment and starting to settle down for later important stages in their mid to later twenties.

*In paid employment or in education and training at age 20 (wave7active):* This accounts for current employment and education status at age 20. We would expect the majority of people by the age of 20 to either be in employment or finishing of education and this variable includes education and training to signify economically active. This has also been included to include people who may be on government training to assist in gaining employment.

*In paid employment or in education and training at age 25 (wave8active):* This accounts for current employment and education status at age 25. We would expect the majority of people by the age of 25 to either be in employment or finishing off education

and this variable includes education and training to signify economically active. This has also been included to include people who may be on government training to assist in gaining employment.

Log annual earnings of those in employment at age 25 (logannual): This variable is included in the outcomes to account for the wages of individuals who are employed. It is measured at age 25 because using earlier ages may introduce bias, as many individuals who are still in education are likely to work part-time rather than full-time, which can distort the picture of their true earnings potential. By age 25, most individuals who were in university have entered the labour market, and those who were not in education are typically at the start of their careers. This age provides a more accurate reflection of earnings, as it accounts for the transition from education to full-time employment, minimising the impact of part-time work and offering a clearer picture of individuals' earning capacity based on their age.

#### 3.4.7 Caring iterations

I analyse the impact of caring dependent on someone providing care across the first 3 sweeps. These refer to ages 14, 15 and 16. I have further split these into 3 distinct samples. The carers included in the subsequent samples include only those who have provided the defined care, the 1 sweep carer sample will not include those who go on to provide 2 or 3 sweeps of care, these individuals will also not be in the non-caring portion of the sample.

Name (samples)	Definition	Non caring	Caring
		sample	sample
Carers	Provided care at least once during the first 3 initial	2,999	346
	sweeps		
1 sweep carer	Provided care only once during first 3 initial sweeps	2,999	216
2 sweep carer	Provided care for 2 sweeps out of the 3 initial	2,999	89
	sweeps		
3 sweep carer	Provided care during all 3 sweeps of the initial 3	2,999	41
	sweeps		
	Combination of 2 and 3 sweep carers		
>1 sweep carer	Provided care for more than 1 sweep during the	2,999	130
	initial 3 sweeps		

#### Table 3.4.7-1: Caring definitions

Table 3.4.7-1 provides the definitions and sample sizes of the caring samples used in the econometric analysis. There are likely to be distinct differences between those who provide care only once and those who provide care for either 2 or all 3 sweeps. The impact of caregiving during the ages of 14 to 16 can vary significantly depending on the duration and intensity of the caregiving experience. Someone who provides care for a brief period, such as once during this time, may face fewer challenges compared to someone who takes on caregiving responsibilities for 2 or 3 years. Extended caregiving typically involves a higher time commitment, leading to increased stress, emotional strain, and physical fatigue. It can also disrupt key aspects of adolescent development, such as education, social interactions, and personal growth, as the individual may have less time for school, extracurricular activities, and friendships. Over time, the cumulative impact of caregiving can negatively affect mental and physical health, as well as educational and career prospects. Moreover, longer caregiving periods can foster a burden of responsibility that might influence their career and aspirations. In contrast, a shorter caregiving experience may not have as lasting an effect on that individuals outcomes in early adulthood or the financial impact on the family unit. Longer periods of caregiving also indicate those involved will be unable to work or maintain a steady income. This can lead to long-term socio-economic challenges, not only for the caregivers but also for their families. Additionally, the reduced income of the household can create a cycle of economic disadvantage, which may influence the socio-economic outcomes of the children involved. This ongoing financial strain can limit access to resources affecting the next children's opportunities and outcomes. Ultimately, the duration of caregiving during these formative years plays a crucial role in determining the extent of its impact on an adolescent's life and their broader socio-economic trajectory. It is for these reasons the samples have been separated.

#### 3.4.8 Summary statistics

In this section, I will examine the differences between non-carers and carers, with a focus on the type of caregiving involved. This analysis will highlight why employing a Propensity Score Matching (PSM) method is a useful approach for accounting for potential selection biases. For both the non-caring and caring groups, the mean values of the relevant variables will be reported. A two-sample t-test, accounting for unequal variances, will be used to assess whether there are significant differences between these groups. Additionally, I will present the mean values of the matched sample, illustrating how propensity score matching reduces bias between the non-caring and caring groups after matching.

	Noncarers	Carers	Diff	Se	Matched sample	Bias Before	Bias after (mean %)
Male	.460	.442	.018	.028	.425	(inean %) 3.7	3.5
Female parent Professional and	.378	.263	.115***	.025	.251	24.9***	2.5
skilled occupations							
Female parent unemployed	.179	.347	167***	.027	.361	38.7***	3.3
Female parent unskilled	.426	.373	.053	.028	.379	$10.8^{*}$	1.2
occupation							
No Male Parent	.204	.272	067**	.025	.277	15.8**	1.4
Male parent unemployed	.041	.159	118***	.020	.159	40.2***	0.0
Male parent unskilled occupation	.160	.139	.022	.020	.142	6.1	0.8
Male parent Skilled trade	.158	.153	.005	.021	.130	1.3	6.4
Male parent professional	.437	.277	.159***	.026	.292	33.7***	3.1
occupation							
Male has a degree	.258	.162	.096***	.021	.156	23.8***	1.4
Female has a degree	.305	.220	.085***	.024	.182	19.5***	8.6
Female is disabled	.022	.092	070***	.016	.069	30.7***	10.1
Male is disabled	.036	.133	097***	.019	.133	35.5***	0.0
Zero siblings	.219	.116	.103***	.019	.101	$28.0^{***}$	3.9
One sibling	.482	.358	.124***	.027	.355	25.3***	0.6
Two siblings	.201	.332	131***	.026	.329	$29.9^{***}$	0.7
Three or Four siblings	.097	.194	096***	.022	.214	27.5***	5.8
HH income max Up to £20,799	.255	.439	185***	.028	.471	39.5***	6.8
HH income max £20,800 -	.312	.301	.011	.026	.295	2.4	1.3
£36,399							
HH income max Over £36,400	.433	.260	.173***	.025	.234	37.0***	5.6
Zero additional adults	.525	.491	.034	.028	.494	6.8	0.6
One additional adult	.344	.341	.003	.027	.332	0.7	1.8
Two or Three additional adults	.130	.168	037	.021	.173	10.5*	1.6
Observations	2999	346	3345	Mean	n bias befo	re 21.4 % af	ter: 3.1 %

Table 3.4.8-1: Caring for at least 1 sweep (wave) sample summary statistics - means

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01, T-Test of sample means

Table 3.4.8-1 displays the means of the variables for the non-caring and caring samples. Carers here refers to caring for 1 or more sweeps. There are some significant differences between the samples. Carers are significantly more likely to have parents who are unemployed or in lower skilled and subsequently paying occupations, with lower parental education. Carers are correlated with larger households, where the propensity to provide care may be higher naturally with more people who potentially require care. Parental disabilities are also higher in the caring sample. These all impact the likelihood to become a carer and their subsequent outcomes like employment. Given the differences between the samples propensity score matching should help match the two samples so the differences in the outcomes of interest are due to the caregiving role than the confounding differences.

Before matching, there are significant differences across many variables, such as female parent professional and skilled occupations (24.9%) this figure refers to the standardised % bias which is the difference of the sample means in the treated and non-treated sub samples, as a percentage of the square root of the average of the sample variances in the treated and non-treated groups. A lower absolute number indicates the samples are more alike and therefore matching has reduced the differences between the samples after matching. Unemployed female parents (38.7%), and disabled individuals (30.7%). These biases suggest that the noncarer and carer groups differ considerably in terms of socio-economic status, disability, family structure, and employment. After matching, these biases are reduced significantly. For instance, the bias for female parents in professional and skilled occupations drops from 24.9% to 2.5%, and unemployed female parents decreases from 38.7% to 3.3%. The overall mean bias before matching is 21.4%, but after matching, the mean bias is reduced to 3.1%. This indicates that matching has effectively adjusted for confounding factors, leading to a more balanced comparison between the two groups.

Matching has helped to address the imbalances in key demographic and socio-economic factors, ensuring that any differences observed between the non-carer and carer groups are less likely to be influenced by underlying biases, thereby increasing the robustness of the findings.

Table 3.4.8-2 continues this analysis for those who provided care for only 1 sweep. The analysis shows significant differences between non-carers and 1 sweep carers, pre matching. Non-carers are more likely to be associated with households with higher incomes, professional occupations, and higher education, while carers tend to have lower incomes, are more likely to have unemployed parents, and have a higher likelihood of parents being in unskilled occupations.

	Non- carers	1 sweep only Carer	Difference	Se	Matched sample	Bias before (mean %)	Bias after (mean %)
Male	.460	.458	.002	.035	.435	0.4	4.6
Female parent Professional and skilled trade occupations	.378	.287	.091**	.032	.306	19.5**	3.9
Unemployed Female parent	.179	.310	131***	.032	.310	30.7**	0.0
Female parent unskilled occupation	.426	.384	.042	.034	.379	8.5	0.9
No Male Parent	.204	.245	041	.030	.236	9.8	2.2
Male parent unemployed	.041	.139	098***	.024	.152	34.8***	4.9
Male parent unskilled occupation	.160	.153	.008	.025	.171	2.1	5.1
Male parent Skilled trade	.158	.153	.005	.025	.125	1.4	7.7
Male parent professional occupation	.437	.310	.127***	.033	.314	26.4***	1.0
Male has a degree	.258	.148	.110***	.026	.134	27.6***	3.5
Female has a degree	.305	.222	.083**	.030	.231	18.9***	2.1
Female is disabled	.022	.056	034*	.016	.037	17.4***	9.6
Male is disabled	.036	.120	085***	.022	.125	31.9***	1.7
Zero siblings	.219	.069	.150***	.019	.069	43.6***	0.0
One sibling	.482	.384	.098**	.034	.379	19.8***	0.9
Two siblings	.201	.361	160***	.034	.361	36.0***	0.0
Three or Four siblings	.097	.185	088**	.027	.189	25.4***	1.3
HH income max Up to £20,799	.255	.412	157***	.034	.425	33.8***	3.0
HH income max £20,800 - £36,399	.312	.296	.015	.032	.277	3.4	4.0
HH income max Over £36,400	.433	.292	.142***	.032	.296	29.8***	1.0
Zero additional adults	.525	.509	.016	.035	.509	3.2	0.0
One additional adult	.344	.352	007	.034	.347	1.6	1.0
Two or Three additional adults	.130	.139	009	.024	.143	2.5	1.4
Observations	2999	216	3215	Mear	n bias before	e 18.6 % afte	er: 2.6 %

#### Table 3.4.8-2: Caring for only 1 sweep (wave) -summary statistics - means

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01, T-Test of sample means

Female parents in professional and skilled trade occupations and those with a degree are more likely to be among non-carers, whereas unemployed female parents and disabled parents are more likely to be amongst carers. Household income also plays a significant role, with non-carers more likely to come from higher-income households. These differences both influence the likelihood to be a carer (disability and parents) and socioeconomic outcomes (parental occupation, household incomes and education). The clear differences would benefit from propensity score matching. Before matching, there are substantial differences (biases) between the non-carers and 1-sweep only carers across various socio-demographic characteristics, with a mean bias of 18.6%. This suggests that the two groups differ significantly in factors such as parental occupation, disability status, household income, and number of siblings. That impact both becoming a carer and later economic outcomes. For instance, there is a large bias in female parents with professional and skilled occupations (19.5%) and in the number of zero siblings (43.6%). Which will influence the likelihood to provide care but also in having a role model that is in a professional, well-paid job increasing resources at home and in the social networks available to influence employment and economic activities. However, after matching, these biases are greatly reduced, with the mean bias falling to just 2.6%. This indicates that matching has effectively controlled for these confounding variables, making the groups more comparable and allowing for a more accurate assessment of differences between non-carers and 1-sweep carers.

	Noncarers	2	Difference	Se	Matched	Bias	Bias
		sweep				before	after
		Carer				(mean	(mean
						%)	%)
Male	.460	.393	.067	.053	.337	13.6	11.4
Female parent Professional and	.378	.236	.143**	.046	.235	31.2***	0.0
skilled occupations							
Unemployed Female parent	.179	.382	203***	.052	.404	46.1***	5.1
Female parent unskilled	.426	.360	.066	.052	.348	13.6	2.3
occupation							
No Male Parent	.204	.326	121*	.051	.393	27.7***	15.4
Male parent unemployed	.041	.180	139**	.041	.123	45.3***	18.3
Male parent unskilled	.160	.112	.048	.034	.089	14.0	6.5
occupation							
Male parent Skilled trade	.158	.135	.023	.037	.146	6.5	3.2
Male parent professional	.437	.247	.190***	.047	.247	4.7***	0.0
occupation							
Male has a degree	.258	.213	.045	.044	.213	1.5	0.0
Female has a degree	.305	.225	.080	.045	.258	18.2	7.7
Female is disabled	.022	.079	057	.029	.089	26.0***	5.2
Male is disabled	.036	.135	099**	.037	.078	35.9***	2.4
Zero siblings	.219	.169	.051	.041	.157	12.8	2.8
One sibling	.482	.315	.168**	.050	.325	34.6***	2.3
Two siblings	.201	.292	091	.049	.269	21.1**	5.2
Three or Four siblings	.097	.225	127**	.045	.247	35.0***	6.2
HH income max Up to £20,799	.255	.472	217***	.054	.483	46.2***	2.4
HH income max £20,800 -	.312	.303	.008	.050	.303	1.8	0.0
£36,399							
HH income max Over £36,400	.433	.225	.209***	.045	.213	45.5***	2.4
Zero additional adults	.525	.472	.053	.054	.483	1.6	2.2
One additional adult	.344	.303	.041	.050	.292	8.8	2.4
Two or Three additional adults	.130	.225	094*	.045	.224	24.8***	0.0
Observations	2999	89	3088	Mean b	ias before 2	4.8 % afte	er: 5.3 %

Table 3.4.8-3: Caring for 2 sweeps (wave) - summary statistics - means

\* p<.10, \*\* p<.05, \*\*\* p<.01, T-Test of sample means

Table 3.4.8-3 continues the analysis. For instance, for 2 sweep/period carers. The data reveals that the caring sample when compared to the non-caring samples has higher instances of parental unemployment. Single parent household. Male parental disability is

also higher impacting the likelihood to provide care. Carers are also associated with lower household incomes. In contrast, non-carers have more professional parents occupations, they have a higher proportion of high-income households. Non carers have a higher incidence of 1 sibling but a low incidence of 3 or 4 siblings.

These findings underscore how socio-economic status, parental occupation, and family dynamics contribute to the likelihood of children assuming caregiving roles.

In addressing the differences between non-carers and carers the t-tests indicate these differences are significant in both their impact on being a carer and on outcomes in later life. This again justifies propensity score matching in that the samples could be better aligned to reduce the bias. This results in the average bias between the samples reducing from 24.8% to 5.3%. Inevitably there remains some significant bias, related to male parental occupations and household demographics these are likely to indicate that some bias remains in the results. Selection bias has been reduced but not eliminated entirely.

Table 3.4.8-4 Continues the analysis for those who provided care for all 3 initial sweeps at ages 14, 15 and 16. Please note the number of observations is very small at 41 matched with 2999 non-caring individuals. The data reveals that the caring sample when compared to the non-caring sample has higher instances of parental unemployment. Parental disability is also higher impacting the likelihood to provide care. Carers are also associated with lower household incomes. In contrast, non-carers have more professional parents occupations, they have a higher proportion of high-income households.

The necessity for matching is evident in the pre matching bias of over 30% but even after matching this is only reduced to nearly 10%. Before matching, there was significant biases between the groups in several variables, with female parents in professional and skilled occupations showing a large bias (41.2%), unemployed female parents showing an even larger bias (63.3%), and female disability showing an extreme bias of 84.6%. This suggests that the two groups differ considerably across multiple factors such as parental occupation, disability status, and income, which could confound the results.

After matching, the bias is reduced significantly across most characteristics. For example, the bias for female parents in professional and skilled occupations drops from 41.2% to 5.5%, and the bias for female disability decreases from 84.6% to 14.0%. The mean bias

before matching is 30.7%, reflecting the substantial imbalances between the two groups, while after matching, the mean bias is reduced to 9.5%, indicating that matching effectively controlled for many of these differences.

	Noncarers	3	Difference	Se	Matched	Bias	Bias
		sweep				before	after
		carer				(mean	(mean
	1.50	1.60		0.50		%)	%)
Male	.460	.463	003	.079	.512	0.6	9.7
Female parent Professional and skilled trade	.378	.195	.183**	.063	.220	41.2**	5.5
Female parent unemployed	.179	.463	284***	.079	.366	63.3***	21.8
Female parent unskilled	.426	.341	.084	.076	.415	17.3	15.0
No Male Parent	.204	.293	088	.072	.268	2.4	5.6
Male parent unemployed	.041	.220	179**	.066	.171	54.6***	14.9
Male parent unskilled	.160	.122	.038	.052	.171	11.0	14.0
Male parent Skilled trade	.158	.195	037	.063	.146	9.8	12.7
Male parent professional	.437	.171	.266***	.060	.244	6.2***	16.5
Male has a degree	.258	.122	.136*	.052	.146	35.1**	6.3
Female has a degree	.305	.195	.110	.063	.244	25.5	11.3
Female is disabled	.022	.317	295***	.074	.366	84.6***	14.0
Male is disabled	.036	.195	159*	.063	.146	51.0***	15.6
Zero siblings	.219	.244	025	.068	.244	5.9	0.0
One sibling	.482	.317	.165*	.074	.317	34.0**	0.0
Two siblings	.201	.268	067	.070	.268	15.7	0.0
Three or Four siblings	.097	.171	073	.060	.171	21.5	0.0
HH income max Up to £20,799	.255	.512	257**	.079	.439	54.5***	15.5
HH income max £20,800 - £36,399	.312	.317	005	.074	.341	1.1	5.2
HH income max Over £36,400	.433	.171	.263***	.060	.220	59.4***	11.0
Zero additional adults	.525	.439	.086	.079	.439	17.2	0.0
One additional adult	.344	.366	021	.077	.415	4.4	1.1
Two or Three additional	.130	.195	065	.063	.146	17.5	13.2
Observations	2999	41	3040	Mean b	bias before 30	).7 % after	: 9.5 %

Table 3.4.8-4: Carer for all 3 sweeps (waves) - summary statistics - means

\* p<.10, \*\* p<.05, \*\*\* p<.01, T-Test of sample means

Overall, the matching process leads to more comparable groups, particularly in terms of socio-economic factors, parental employment status, and disability, making the results more valid for analysis. This reduction in bias helps mitigate potential confounders and improves the reliability of subsequent analyses. However there remains some issues with the mean bias after matching being nearly 10%, the differences between 3 sweep carers and non-carers is significantly different. This is further complicated by the small caring sample that further complicates the matching potential and is likely to bias the results. As a result, I have decided to combine 3 sweep and 2 sweep carers into a "more than 1 sweep

carer sample". To ensure there are not significant differences between the characteristics of 2 sweep and 3 sweep carers which would cause bias in combining these 2 samples, I shall compare the means of these samples in Table 3.4.8-5. The only statistically different variable between the 2 samples is female disability. This is suboptimal as female parental disability is a key determinant of being a carer, this is shown in the research where fathers are less likely to provide care in all studies and in many cases are replaced by children.

This will complicate the analysis as there is likely to be some bias as a result of 3 sweep carers having very high percentages of female parental disability. However overall, 2 sweep and 3 sweep carers are similar across all other variables. In sharing similar characteristics, caution must be taken given the differences in disability a leading cause of providing care.

	2	3	Differences	
	sweeps	sweeps		
	Mean	Mean	В	Se
Male	.393	.463	070	.094
Female parent Professional and	.236	.195	.041	.077
skilled trade occupations				
Female parent unemployed	.382	.463	081	.094
Female parent unskilled occupation	.360	.341	.018	.091
No Male Parent	.326	.293	.033	.088
Male parent unemployed	.180	.220	040	.077
Male parent unskilled occupation	.112	.122	010	.062
Male parent Skilled trade	.135	.195	060	.072
Male parent professional occupation	.247	.171	.076	.075
Male has a degree	.213	.122	.092	.068
Female has a degree	.225	.195	.030	.077
Female is disabled	.079	.317	238**	.079
Male is disabled	.135	.195	060	.072
Zero siblings	.169	.244	075	.079
One sibling	.315	.317	002	.089
Two siblings	.292	.268	.024	.085
Three or Four siblings	.225	.171	.054	.074
HH income max Up to £20,799	.472	.512	040	.095
HH income max £20,800 - £36,399	.303	.317	014	.088
HH income max Over £36,400	.225	.171	.054	.074
Zero additional adults	.472	.439	.033	.095
One additional adult	.303	.366	062	.091
Two or Three additional adults	.225	.195	.030	.077
Observations	89	41		

Table 3.4.8-5: Testing means between 2 sweep and 3 sweep carers

\* p<.10, \*\* p<.05, \*\*\* p<.01, T-Test of sample means

Table 3.4.8-6 displays the combined 2 and 3 sweep carers with the non-caring sample, revealing several significant differences. Carers have a higher proportion of unemployed female parents whilst those with male parents in professional occupations are more likely to be non-carers. Similarly, children from lower-income households (up to  $\pounds$ 20,799) are significantly more likely to be carers, while those from higher-income households (over  $\pounds$ 36,400) are less likely. A higher prevalence of disability in either female or male parents is associated with the caring sample. Carers are more likely to have multiple siblings. Lastly, outcome variables like employment show that children who are carers are less likely to be employed by age 25 and engage in employment at later waves. These findings indicate that socio-economic factors, family structure, and parental employment status significantly affect the likelihood of children becoming carers. This justifies the necessity for propensity score matching.

The mean bias before matching was 25% with post matching now 5.2%. Before matching, there are substantial biases in key variables such as female parents in professional and skilled occupations (bias of 33.0%), unemployed female parents (bias of 49.3%), and male parents with disabilities (bias of 38.5%), indicating large imbalances between the two groups on these characteristics. These differences suggest that the two groups were not comparable prior to matching, with certain characteristics (e.g., socioeconomic status, disability, and parental occupation) differing markedly.

After matching, the bias is substantially reduced across most characteristics, leading to more comparable groups. For instance, the bias for female parents in professional and skilled occupations drops from 33.0% to 1.7%, and for unemployed female parents, it decreases from 49.3% to 5.2%. Overall, the mean bias before matching is 24.9%, while after matching, it significantly drops to 5.2%. This indicates that matching has successfully reduced the differences between the groups, helping to mitigate confounding factors and resulting in a more balanced comparison for estimating causal effects.

	Noncarers	>1 sweep carer	Difference	Se	Matched	Bias before (mean %)	Bias after (mean %)
Male	.460	.415	.045	.044	.384	9.1	6.2
Female parent Professional and skilled occupations	.378	.223	.155***	.038	.230	34.3***	-1.7
Unemployed Female parent	.179	.408	228***	.044	.361	51.7***	10.4
Female parent unskilled occupation	.426	.354	.072	.043	.407	14.8	11
No Male Parent	.204	.315	111**	.042	.346	25.5***	7.1
Male parent unemployed	.041	.192	152***	.035	.176	48.5***	7.1
Male parent unskilled occupation	.160	.115	.045	.029	.076	13.1	11.2
Male parent Skilled trade	.158	.154	.004	.032	.146	1.1	6.4
Male parent professional occupation	.437	.223	.214***	.038	.223	46.6***	0
Male has a degree	.258	.185	.073*	.035	.146	17.7*	9.3
Female has a degree	.305	.215	$.090^{*}$	.037	.223	$20.5^{*}$	1.8
Female is disabled	.022	.154	132***	.032	.161	47.7***	2.8
Male is disabled	.036	.154	118***	.032	.123	41.1***	10.7
Zero siblings	.219	.192	.027	.036	.161	6.6	7.6
One sibling	.482	.315	.167***	.042	.338	34.5***	4.8
Two siblings	.201	.285	083*	.040	.269	19.5**	3.6
Three or Four siblings	.097	.208	110**	.036	.230	31.0***	6.5
HH income max Up to £20,799	.255	.485	230***	.045	.430	48.9***	11.6
HH income max £20,800 - £36,399	.312	.308	.004	.042	.323	0.9	3.3
HH income max Over £36,400	.433	.208	.226***	.037	.246	49.8***	8.5
Zero additional adults	.525	.462	.064	.045	.477	12.7	3.1
One additional adult	.344	.323	.021	.042	.307	4.5	3.3
Two or Three additional adults	.130	.215	085*	.037	.215	22.6***	0.0
Observations	2999	130	3129 Mean bias b after:		as before 2 ter: 5.9 %	26.2 %	

### Table 3.4.8-6: Combined multi and non-carers

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01, T-Test of sample means

#### 3.4.9 Differences in outcomes variables before and after matching

It is also important to determine if the differences in the means of the outcome variables are similar after matching to determine if the matching procedure has worked sufficiently.

Variable mean	All Conona	1	2 autoon aanon	>1 sweep	2 autoon aanon				
matching	All Callers	1 Sweep caref	2 sweep caref	carer	5 Sweep caref				
Ever emp	loyed (everem	) difference in me	ean between carer	s & non-carers (a	ged 25)				
Before matching	.046	.021	.057	.087	.127				
After matching	.046	.006*	.034*	.063*	.150				
Employed	l wave 8 (wave	B) difference in me	ean between carer	s & non-carers (a	ged 25)				
Before matching	.061	.037	.095	.101	.113				
After matching	.055*	.003*	.045*	.047*	.177				
Employed	Employed wave 7 (wave7) difference in mean between carers & non-carers (aged 20)								
Before matching	.025	.018	.074	.036	.021				
After matching	.013*	.011*	.063*	.028*	.103				
Economically acti	ve wave 8 (wav	e8active) differen	ice in mean betwe	en carers & non-c	arers (aged 25)				
Before matching	.068	.046	.106	.103	.097				
After matching	.059*	.010*	.050*	.034*	.143				
Economically acti	ve wave 7 (wav	e7active) differen	ice in mean betwe	en carers & non-c	arers (aged 20)				
Before matching	.008	.007	.022	.033	.058				
After matching	.003*	.011	.012*	.023*	.043*				
Observations	3345	3215	3088	3129	3040				
Logannual (	logannual) inco	ome difference in i	mean between car	ers & non-carers	(aged 25)				
Before matching	.046	.045	.002	.047	.156				
After matching	.035*	.029*	.091	.043*	.068*				
	2948	2948	2948	2763	2692				

#### Table 3.4.9-1: Outcome means pre and post matching

A \* star indicates difference in means is reduced (absolute) after matching

#### Table 3.4.9-2: Means of outcomes before and after matching

Outcomes	Non carers	All	Mat'd	One	Mat'd	Two	Mat'd	>1	Mat'd	Three	Mat'd
everemp (aged 25)	.956	.919	.956	.944	.942	.899	.950	.877	.951	.829	.979
wave8 (aged 25)	.893	.832	.888	.856	.853	.798	.880	.792	.866	.780	.957
wave7 (aged 25)	.467	.431	.455	.444	.461	.393	.521	.408	.495	.439	.385
wave8active (aged 25)	.926	.858	.918	.880	.890	.820	.896	.823	.912	.829	.972
wave7active (aged 25)	.887	.879	.882	.894	.883	.865	.892	.854	.898	.829	.872
logannual (aged 25)	9.661	9.615	9.583	9.616	9.588	9.663	9.560	9.614	9.591	9.505	9.573

Table 3.4.9-1 displays the differences in the means of the outcome variables for each sample before and after matching in absolute terms. For everemployed by the age of 25 matching reduces the difference in the mean for all samples except the 3 sweeps only carers. This is the same story for wave8, wave8active and wave7. For wave7active the reduction applies for all samples except one sweep carers where the difference is .004. Logannual effectively matches on all samples except 2 sweep carers and for students this reduction only applies to all carers and 1 sweep carers. Matching is similar for 2 sweeps and 3 sweep carers. Overall, the matching has reduced the differences in means for the outcome variables, there remains issues with the size of the 3-sweep sample in isolation.

## 3.5 Results

In this section, I present the results of our Probit models, estimated using propensity score matching (PSM) to assess the relationship between being a middle adolescent carer and the discussed outcome variables. These models account for the selection bias that may arise due to non-random treatment assignment, providing more robust estimates of treatment effects modelling on the propensity score should reduce the bias. I first discuss the results of the main Probit PSM models, highlighting key findings for each outcome variable. Following this, I conduct a series of robustness checks to ensure the stability and reliability of our results under different model specifications and assumptions. Throughout, our sample of noncarers is 2,999.

3.5.1	Initial results from	propensity score	matching – ties	and replacement
			0	

All ca	arers	1 sweep carer	2 sweep carer	>1 sweep carer	3 sweep carer					
Carers	no: 346	216	89	130	41					
Pre bias	21.4%	18.6%	24.8%	26.2%	30.7%					
Post bias	3.1%	2.6%	5.3%	5.9%	9.5%					
Ever emp	Ever employed (aged 25)									
-0.0	37**	0.003	-0.051	-0.074**	-0.149***					
(0.0	18)	(0.022)	(0.035)	(0.033)	(0.035)					
Employe	d wave 8 (a	nged 25)								
-0.0	55**	0.003	-0.082*	-0.073*	-0.176***					
(0.0	25)	(0.033)	(0.04)	(0.043)	(0.040)					
Employe	d wave 7 (a	nged 20)								
-0.025		-0.017	-0.128**	-0.087	0.054					
(0.035)		(0.040)	(0.059)	(0.055)	(0.077)					
Economi	cally active	wave 8 (aged 25)								
-0.0	60**	-0.011	-0.076** -0.089**		-0.143***					
(0.0	23)	(0.031)	(0.037)	(0.038)	(0.034)					
Economi	cally active	wave 7 (aged 20)								
-0.0	004	0.010	0.027	-0.044	-0.043					
(0.0	24)	(0.030)	(0.042)	(0.036)	(0.072)					
Observat	ions									
33	45	3215	3088	3129	3040					
Logannua	al income (	aged 25)								
0.0	41	0.009	0.075	0.051	-0.121					
(0.0	947)	(0.056)	(0.093)	(0.079)	(0.131)					
Carers	no: 288	185	71	103	32					
Observat	ions (2,660	) non-carers)								
29	48	2845	2731	2763	2692					

Table 3	3.5.1-1:	Results
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ATT coefficients presented with se errors in brackets. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 3.5.1-1 (green section) shows that compared to non-carers the impact of being a carer on ever being employed is not straight forward. All carers were 3.7% less likely to have gained paid employment by the age of 25. One sweep carers had no permanent impact on gaining employment. 2 sweep carers again showed no permanent impact, whilst those who provide care for more than 1 wave the combination of 2 and 3 sweep carers showed that carers were 7.4% less likely to gain employment. Finally, three sweep carers were nearly 15% less likely to gain employment. For those employed at wave 8 (orange), all carers were 5.5% less likely to be employed at wave 8 with no impact for those at wave 7 aged 20. Again, 1 sweep carers do not appear to be impacted at aged 25 or aged 20. 2 sweep carers were 8.2 % less likely to be employed at aged 25 and 12.8% at 20 years old. Those who provided care for more than 1 sweep were 7.3% less likely to be employed at age 25. Finally, the 3 sweep carers were 17.6% less likely at 25.

For those economically active in either work or education. All carers were only 6 % less likely to be economically active at aged 25. 1 sweep carers were not impacted. Two sweep carers were 7.6% less likely, more than 1 sweep carers were 8.9% less likely and finally three sweep carers were 14.3% less likely at age 25. None were significantly impacted at age 20. For all caring iterations there was no effect of caring on earnings at the age of 25.

I shall now provide some alternative matching approaches as discussed in 3.4.2, on page 117. The matching approaches are (PSM) with replacement, no replacement, matching to 3, 5 and 10 nearest neighbours based on the propensity score, with caliper matching within 0.1 and 0.01 standard deviation (SD) of the propensity score, these are the differences in propensity scores (PS) between treated and untreated pairs that are formed where the propensity score differs by this fixed distance.

#### 3.5.2 Robustness checks – alternative matching approach

Table 3.5.1-1 shows the estimates of the treatment effect results, using propensity score matching 1 to 1 with replacement and ties allowed. In addressing the shortcomings in different matching techniques there are trade-offs for example: I have included no replacement models to address the shortcomings in the replacement model, where repetitive controls i.e. individuals can increase the variance, but this is accompanied by an increase in the bias. I have included matching to more than 1 nearest neighbour, in theory this increases the matched sample size and reduces the variance of the estimator when there is sufficient overlap but can increase the bias. I have also included radius

caliper matching that is a hybrid bringing one to many and caliper matching together. We address the potential for lower quality matches by robustly checking alternative matching procedures to reduce the bias in differences between those treated and those being matched. The earnings outcome is consistently insignificant throughout the main and alternative models.

3.5.3	All carers	matching -	robustness
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Outcomo	Carora	Doplaco	Noronlaco	3	5	10	Caliper	Caliper
Outcome	Caleis	Replace	Noreplace	N-bours	N-bours	N-bours	0.1	0.01
Everemp	ATT	037**	031*	011	016	022	032**	030*
	Se	(.018)	(.017)	(.017)	(.017)	(.016)	(.015)	(.016)
Wave 8	ATT	055**	042*	026	029	041*	041*	041*
	Se	(.025)	(.024)	(.024)	(.023)	(.023)	(.021)	(.022)
Wave 7	ATT	025	040	022	029	029	033	042
	Se	(.036)	(.034)	(.033)	(.032)	(.031)	(.029)	(.030)
Wave 8	ATT	060***	047**	038*	047**	050**	052***	047**
Active	Se	(.023)	(.022)	(.022)	(.021)	(.021)	(.020)	(.020)
Wave 7	ATT	004	001	.007	.004	.009	.006	.001
Active	Se	(.023)	(.022)	(.022)	(.021)	(.020)	(.019)	(.020)
Standardised mear	l % bias in ns	3.076	4.362	3.370	3.273	3.092	7.862	2.098
Logannual	ATT	.041	.035	.008	.011	.023	014	.012
	Se	(.047)	(.044)	(.042)	(.040)	(.039)	(.035)	(.036)
Standardised mear	l % bias in ns	3.543	4.414	3.231	2.975	2.788	8.231	2.353

Table 3.5.3-1: Alternative matching criteria all carers

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 3.5.3-1 shows the matching qualities for our models of carers and non-carers. What is important to note is that our no replacement and nearest neighbour matching models increase the bias between groups compared to the baseline of 1 to 1 with replacement. Our matching methods biases are consistently below 5 % excluding 0.1 caliper. The absolute significance of our outcome variables is consistent with the caliper 0.01 models in this model the distance between those matched on the propensity score is the closest and the bias between the treated and controls is the smallest. However, employed by the age of 25 reduces from 3.7 to 3 % now at 10% significance. Employed at wave 8 reduces from 5.5 to 4.1 % and economically active at wave 8 is now 4.7 compared to 6 %. Figure 3.5.3-1 however shows a comparison between 1 to 1 matching and radius caliper matching at 0.01 SD of the (PS). This indicates that the matching was better using our

baseline 1 to 1 matching method compared to the radius matching. PS's have greater variation in density in the radius matching.



Figure 3.5.3-1: Baseline vs radius matching density propensity scores - carers

3.5.4	One sweep carers	matching -	robustness
0.0		matoring	10000010000

Outcomo	1 auroon	Poplaco	Noronlaco	3	5	10	Caliper	Caliper
Outcome	1 Sweep	Replace	Noreplace	N-bours	N-bours	N-bours	.1	.01
Everemp	ATT	.003	006	001	005	004	009	006
	Se	(.019)	(.019)	(.018)	(.018)	(.017)	(.016)	(.016)
Wave 8	ATT	.003	009	004	013	007	029	019
	Se	(.030)	(.029)	(.028)	(.027)	(.026)	(.025)	(.025)
Wave 7	ATT	017	024	002	014	008	022	017
	Se	(.044)	(.043)	(.040)	(.039)	(.037)	(.035)	(.036)
Wave 8	ATT	011	021	018	027	024	041	030
Active	Se	(.027)	(.026)	(.026)	(.025)	(.024)	(.023)	(.023)
Wave 7	ATT	.010	.012	.017	.012	.022	.010	.017
Active	Se	(.028)	(.027)	(.025)	(.024)	(.023)	(.022)	(.023)
Standardised mea	d % bias in ns	2.605	4.596	3.569	3.380	3.097	10.71	2.522
Logannual	ATT	.009	033	022	016	006	026	.000
	Se	(.055)	(.050)	(.047)	(.045)	(.043)	(.039)	(.041)
Standardised mea	d % bias in ns	4.891	4.388	3.077	2.755	3.001	10.62	1.692

Table 3.5.4-1: Alternative matching criteria 1 sweep carer

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 3.5.4-1 shows the robustness results for 1 sweep carers. These models are consistent across the variations in propensity specification. The bias increase from the

baseline in the subsequent 4 models where alternative matching increased the bias across the comparison groups. The caliper matching further decreased the bias, but the results did not differ from our baseline model. Again Figure 3.5.4-1 indicates that matching was better in our baseline model (left panel).





	3.5.5	Two Sweep carers	matching -	robustness
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		1		2	_	10		0.1:
Outcome	2 sweens	Replace	Norenlace	3	5	10	Caliper	Caliper
outcome	2 3000005	Replace	noreplace	N-bours	N-bours	N-bours	.1	.01
Everemp	ATT	051	050	043	035	029	054*	036
	Se	(.037)	(.037)	(.035)	(.034)	(.034)	(.032)	(.033)
Wave 8	ATT	082	079	088*	046	040	087*	051
	Se	(.051)	(.051)	(.047)	(.046)	(.045)	(.043)	(.044)
Wave 7	ATT	128**	149**	102*	063	047	071	065
	Se	(.067)	(.066)	(.061)	(.058)	(.056)	(.053)	(.054)
Wave 8	ATT	076	077*	082*	050	057	098**	063
Active	Se	(.047)	(.047)	(.044)	(.044)	(.043)	(.041)	(.042)
Wave 7	ATT	027	030	031	012	.001	019	003
Active	Se	(.044)	(.044)	(.041)	(.040)	(.039)	(.037)	(.038)
Standardise mea	d % bias in Ins	5.278	5.972	6.039	6.241	6.276	20.62	2.917
Logannual								
	ATT	.075	.073	.108	.110	.113	.008	.077
	Se	(.093)	(.093)	(.084)	(.081)	(.079)	(.074)	(.075)
Standardise mea	d % bias in Ins	7.728	8.110	5.597	5.403	5.120	20.49	3.053

Table 3.5.5-1: Alternative matching criteria two sweep carers

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01
The results in Table 3.5.5-1 refer to two sweep carers. In the baseline models the bias between those treated and untreated is still larger than 5 %. Although there is no agreed upon perfect bias post matching there is an unagreed rule of thumb that 5 to 10% should be the maximum. If we assume this then the radius caliper 0.01 model reduces the bias the most and is generally consistent but wave 7 is no longer significant, unlike the baseline models where employed at age 20 was reduced by 13 to 15 %. Active at wave 8 becomes significant for the no replacement and 0.1 callipers these results are an outlier in this model. There remains some concerns with the radius caliper matching for this and the subsequent 2 samples that will be discussed in the robustness conclusion. Figure 3.5.5-1 further indicates the radius matching does not improve the matching, it appears that the distance between the propensity scores is noisier in the radius matching.



Figure 3.5.5-1: Baseline vs radius matching density propensity scores – two sweeps

## 3.5.6 More than one sweep carers matching - robustness

Table 3.5.6-1 displays the results for the morethan1 sub sample. The baseline model has a bias of nearly 6 % all of the models apart from caliper 0.1 reduce bias. Being employed by the age of 25 is consistent across all models with the impact ranging from 5.2 to 7.4 %. The other outcomes are insignificant for all the models where bias is below that of the

baseline. Figure 3.5.6-1 indicates that the controls have a higher variation from the propensity score in the radius caliper method.

Outcomo	More	Poplaco	Noroplaco	3	5	10	Caliper	Caliper
Outcome	than 1	Replace	Noreplace	N-bours	N-bours	N-bours	.1	.01
Everemp	ATT	074**	068**	057*	052*	059*	070**	056*
	Se	(.033)	(.033)	(.032)	(.031)	(.030)	(.029)	(.030)
Wave 8	ATT	073*	057	055	044	059	075**	047
	Se	(.043)	(.042)	(.040)	(.039)	(.038)	(.036)	(.038)
Wave 7	ATT	087	051	049	041	053	049	044
	Se	(.058)	(.055)	(.052)	(.050)	(.048)	(.045)	(.047)
Wave 8	ATT	089**	074*	058	050	064*	084**	053
Active	Se	(.039)	(.039)	(.037)	(.036)	(.036)	(.034)	(.035)
Wave 7	ATT	044	023	019	013	013	021	015
Active	Se	(.039)	(.038)	(.036)	(.034)	(.034)	(.032)	(.034)
Standardised mean	l % bias in ns	5.889	3.870	4.530	4.203	3.853	13.83	1.656
Logannual								
	ATT	.051	.036	.014	.038	.023	009	.041
	Se	(.079)	(.077)	(.071)	(.070)	(.067)	(.063)	(.066)
Standardised mean	l % bias in ns	4.330	4.752	3.404	3.499	2.812	13.51	2.204

Table 3.5.6-1: Alternative matching criteria more than 1 sweep carer

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Figure 3.5.6-1: Baseline vs radius matching density propensity scores more that	an 1
sweep	



Outcome	2	Damlaga	Normalana	3	5	10	Caliper	Caliper
Outcome	3 sweeps	Replace	Noreplace	N-bours	N-bours	N-bours	.1	.01
Everemp	ATT	149**	149**	113*	119*	123**	115*	118*
	Se	(.063)	(.063)	(.063)	(.061)	(.061)	(.060)	(.061)
Wave 8	ATT	176**	176**	090	090	086	071	090
	Se	(.073)	(.072)	(.072)	(.070)	(.069)	(.067)	(.069)
Wave 7	ATT	.054	.054	.040	.020	.026	005	.001
	Se	(.102)	(.100)	(.093)	(.089)	(.086)	(.081)	(.085)
Wave 8	ATT	143**	143**	082	083	078	076	075
Active	Se	(.067)	(.066)	(.065)	(.064)	(.062)	(.060)	(.062)
Wave 7	ATT	043	024	008	004	.014	031	013
Active	Se	(.074)	(.073)	(.069)	(.067)	(.065)	(.061)	(.063)
Standardise	d % bias in	9.475	10.14	7.317	8.122	7.638	15.13	9.093
mea	ns							
Logannual								
	ATT	121	126	106	0711	0455	100	0342
	Se	(.131)	(.128)	(.122)	(.124)	(.122)	(.116)	(.127)
Standardised mea	d % bias in ns	1.42	11.64	13.74	11.67	9.244	15.39	6.421

3.5.7 Three sweep carer matching - robustness

Table 3.5.7-1: Alternative matching criteria 3 sweep carer

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Figure 3.5.7-1: Baseline vs radius matching density propensity scores - three sweeps



Table 3.5.7-1 displays the results for the three-sweep sub sample. The baseline model has a bias of over 9 %, all of the models apart from caliper0.1 and no replacement reduce bias.

being employed by the age of 25 is consistent across all models with the impact ranging from 11 to 15 %. The other outcomes are insignificant for all the models where bias is below that of the baseline. The results further signify that the characteristic differences in three sweep carers and non-carers is too great for effective matches with the differences across the variable means being above 7%. Many 3 sweep carers are likely to have been matched with individuals too far away despite being different. Again Figure 3.5.7-1 indicates the radius matching introduces variance and matching is not as optimal as 1 to 1 matching (baseline) models.

3.5.8	Robustness	s using logit
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Outcomo	Caror	Poplaco	Noreplace	3	5	10	R cal	R cal
Outcome	Calei	Replace		N-bours	N-bours	N-bours	.1	.01
Everemp	ATT	044**	035**	034**	032*	030*	032**	029*
	SE	(.018)	(.017)	(.017)	.016)	.016)	.015)	.016)
Wave8	ATT	056**	051**	045*	042*	043*	042*	040*
	SE	(.025)	(.024)	(.024)	(.023)	(.022)	(.021)	(.022)
Wave 7	ATT	048	022	046	049	039	032	035
	SE	(.036)	(.034)	(.033)	(.032)	(.031)	(.029)	(.030)
Wave 8	ATT	060***	049**	049**	052**	049**	053***	046**
Active	SE	(.023)	(.022)	(.022)	(.021)	(.021)	(.020)	(.020)
Wave 7	ATT	008	.006	018	009	000	.005	.007
Active	SE	(.023)	(.022)	(.021)	(.021)	(.020)	(.019)	(.020)
Standardised % bias	in means	3.210	3.776	3.117	3.205	3.007	8.049	2.122
Logannual	ATT	.011	.037	.042	.039	.025	013	.008
_	SE	(.046)	(.044)	(.043)	(.040)	(.039)	(.035)	(.037)
Standardised % bias	in means	2.315	4.631	2.054	2.359	3.205	8.266	1.885

Table 3.5.8-1: Alternative matching criteria all carers - logit

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 3.5.8-1 provides the results for all carers now using a logit model. The results are fairly consistent with the probit model in Table 3.5.3-1. The only differences are the nearest neighbour matches for everemployed, wave 8 and wave 8 active which are now significant. The impact of being a carer remains moderate. The likelihood to be employed is reduced by 2.9 to 4.4 percent. Being employed at age 25 is reduced by 4 to 5.6 % and being economically active is reduced by 4.6 to 6 %. These contrast with the probit models being between 3 & 3.7 %, 4.1 & 5.5% and 3.8 to 6 % respectively. The bias reductions are also similar.

							-	
Outcomo	One sweep	Poplaco	Noroplaco	3	5	10	D col 1	R cal
Outcome	carer	Replace	Noteplace	N-bours	N-bours	N-bours	K Cal .1	.01
Everemp	ATT	005	020	010	005	011	010	005
	SE	(.019)	(.018)	(.018)	(.018)	(.017)	(.016)	(.017)
Wave8	ATT	015	034	019	017	019	029	008
	SE	(.030)	(.029)	(.028)	(.027)	(.026)	(.025)	(.025)
Wave 7	ATT	036	043	029	029	024	021	017
	SE	(.044)	(.043)	(.040)	(.039)	(.038)	(.035)	(.036)
Wave 8	ATT	036	051	039	038	038	041	026
active	SE	(.027)	(.026)	(.025)	(.025)	(.024)	(.023)	(.023)
Wave 7	ATT	010	001	005	.008	.018	.010	.021
active	SE	(.027)	(.027)	(.025)	(.025)	(.024)	(.022)	(.023)
Standardised %	6 bias in means	2.448	3.910	2.465	3.122	3.473	1.80	1.850
Logannual	ATT	013	021	035	016	014	025	003
-	SE	(.056)	(.051)	(.048)	(.046)	(.043)	(.040)	(.041)
Standardised %	6 bias in means	4.450	3.288	4.615	4.217	3.819	1.66	1.518

 Table 3.5.8-2: Alternative matching criteria 1 sweep carer - logit

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 3.5.8-2 presents the results for 1 sweep carers using a logit these results conform to those seen in Table 3.5.4-1.

Table 3.5.8-3: Alternative matching criteria two sweep carers - logit	

Outcome	Two sweep carers	Replace	Noreplace	3 N-bours	5 N-bours	10 N-bours	R cal .1	R cal .01
Everemp	ATT	026	024	011	013	019	054*	025
	SE	(.038)	(.038)	(.036)	(.035)	(.034)	(.032)	(.031)
Waya	ATT	040	029	023	027	043	087**	044
waveo	SE	(.051)	(.051)	(.048)	(.046)	(.045)	(.043)	(.043)
Wave 7	ATT	074	070	077	060	061	071	053
	SE	(.066)	(.066)	(.060)	(.058)	(.056)	(.053)	(.054)
Wave 8	ATT	035	029	032	044	052	099**	055
active	SE	(.047)	(.047)	(.045)	(.044)	(.043)	(.041)	(.041)
Wave 7	ATT	.000	013	004	000	005	019	006
active	SE	(.044)	(.044)	(.041)	(.040)	(.039)	(.037)	(.038)
Standardised % b	ias in means	6.714	4.609	6.780	6.504	6.195	2.50	2.214
Logannual	ATT	.107	.077	.097	.085	.107	.011	.071
	SE	(.093)	(.091)	(.086)	(.082)	(.079)	(.074)	(.075)
Standardised % b	ias in means	6.156	7.912	6.332	5.484	5.728	19.86	1.989

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 3.5.8-3 presents the logit equivalent of those seen in Table 3.5.5-1. The results are similar to those seen in the probit models.

Outcome	More	Doplaça	Norenlace	3	5	10	R cal	R cal
Outcome	than 1	Replace	Noreplace	N-bours	N-bours	N-bours	.1	.01
Everemp	ATT	077**	086***	055*	053*	054*	070**	067**
	SE	(.033)	(.032)	(.031)	(.031)	(.031)	(.029)	(.030)
Wave8	ATT	068	067	041	036	051	074**	058
	SE	(.044)	(.042)	(.040)	(.039)	(.038)	(.037)	(.037)
Wave 7	ATT	048	037	063	061	035	048	040
	SE	(.057)	(.055)	(.051)	(.049)	(.048)	(.045)	(.047)
Wave 8	ATT	073*	083**	058	056	069*	084**	073**
active	SE	(.040)	(.039)	(.037)	(.036)	(.036)	(.034)	(.035)
Wave 7	ATT	.028	.016	005	014	014	021	011
active	SE	(.040)	(.039)	(.036)	(.034)	(.034)	(.032)	(.033)
Standardised % b	ias in means	5.920	5.237	5.593	5.490	4.953	13.85	1.388
Logannual	ATT	.048	.033	.042	.023	.035	010	.038
	SE	(.081)	(.078)	(.072)	(.069)	(.067)	(.063)	(.066)
Standardised % bias in means		4.669	5.071	3.570	4.098	3.568	13.52	2.121

Table 3.5.8-4: Alternative matching criteria more than 1 sweep carer - logit

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 3.5.8-4 present the logit equivalent of the models in Table 3.5.6-1. Ever being employed decreases by between 5.3 and 8.6 % compared to 5.2 and 7.4 % in the probit models. Being employed loses its significance in the baseline model but like the probit model it is significant at 7.4 % in the radius caliper .1 model. Being economically active at age 25 decreases by 6.9 to 8.3% compared to 6.4 and 8.9% in the probit models. These results corroborate the results using the probit model.

Outcomo	Three	Poplaco	Noronlaco	3	5	10	R cal	R cal
Outcome	sweeps	Replace	Noreplace	N-bours	N-bours	N-bours	.1	.01
Everemp	ATT	122*	128**	098	114*	112*	112*	111*
	SE	(.065)	(.065)	(.063)	(.062)	(.061)	(.060)	(.061)
Wave8	ATT	120	114	086	077	060	070	047
	SE	(.075)	(.075)	(.071)	(.070)	(.070)	(.067)	(.066)
Wave 7	ATT	.036	.048	020	023	015	005	010
	SE	(.102)	(.099)	(.091)	(.088)	(.086)	(.081)	(.087)
Wave 8	ATT	098	086	084	084	065	080	073
active	SE	(.068)	(.068)	(.065)	(.064)	(.063)	(.061)	(.062)
Wave 7	ATT	.030	.018	.007	.007	007	036	052
active	SE	(.077)	(.075)	(.069)	(.067)	(.064)	(.061)	(.066)
Standardise mea	d % bias in ans	11.63	9.358	8.504	7.757	7.684	14.11	7.714
Logannual	ATT	157	177	0859	0993	0494	0733	0255
	SE	(.131)	(.126)	(.126)	(.126)	(.122)	(.117)	(.128)
Standardise mea	d % bias in ans	9.896	1.39	7.144	6.531	4.742	12.17	9.121

Table 3.5.8-5: Alternative matching criteria 3 sweep carer - logit

Standard errors in parentheses t stats \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 3.5.8-5 present the logit equivalent of the models in Table 3.5.7-1. Ever being employed for 3 sweep carers reduces between 11.1 and 12.8 % compared to 11.3 and

14.9 % in the probit models. However, being employed and economically active at age 25 is no longer significant.

3.5.9 Robustness conclusion

There is a trade-off between various matching methods. One-to-one matching with ties ensures that individuals who are the closest match are compared to each other. However, propensity score matching accounts for all covariates in the model, which means individuals may have similar propensity scores, even if they differ in other characteristics. The value of propensity scores lies in their simplicity. The process begins with running a regression where the treatment or control group is the dependent variable, and the potential confounders are the predictors. As group membership is usually binary, logistic or probit regression is typically used. This yields a propensity score for each individual, ranging from 0 to 1. This score has no intrinsic meaning—it's not inherently "good" or "bad." Instead, it summarises the influence of the predictors on group membership. This mean that some individuals with significant differences can still have similar or the same propensity score as it is a culmination of the combination of the covariates. However, has I have shown in the previous section when alternative matching methods are used these can change the results because of the impact of disparate or distanced matches, though similar in propensity score can change the outcome from the baseline models used in this paper of 1 to 1 matching.

In my attempt to reduce the bias between groups this can change the density and distribution of matches. Therefore, I believe the baseline models may be the more appropriate method when there are concerns of significant and substantial matches like those in our multiple care sweeps models.

## 3.6 Summary of results

The analysis presents results across distinct samples of caregivers, categorised by the number of caregiving "sweeps" they provided. These categories include all caregivers, those who provided care for only one sweep, two sweeps, more than one sweep (a combination of two and three sweeps), and caregivers who provided care for three sweeps. The rationale for this breakdown is that the impact of caregiving may vary based on the duration of care and its disruptive effects on other aspects of life. Our findings reflect this, with one-sweep caregivers showing little to no impact, whereas caregiving became increasingly detrimental as the frequency of care increased.

For the initial combined sample of all caregivers, baseline models using probit and logit regressions suggest that caregiving reduces the likelihood of having gained employment by age 25 by 3.7% (at 5%) and 4.4% (at 5%), respectively. However, when applying Radius Caliper Matching (RCM), a method that minimises standardised differences in means between groups, this reduction decreased to 3% (at 10%) and 2.9% (at 10%), respectively. The likelihood of being employed at age 25 was reduced by 5.5% (at 5%) and 5.6% (at 5%) in the probit and logit models, respectively, but with RCM, this reduction dropped to 4.1% and 4% (at 10%). Economic activity at age 25 was reduced by 6% (at 1%) for both models, but with RCM, the reduction was smaller at 4.7% and 4.6% (at 5%) respectively. Employment and economic activity at age 20 were largely unaffected by caregiving, potentially due to the influence of students, part-time jobs, and efforts to gain employment, which could explain the insignificant impact of caregiving at this age. Earnings, as noted earlier, appeared unaffected across models. This may be due to the fact that many individuals in this early adulthood stage are employed in entry-level, minimum-wage jobs, with students and part-time work influencing the results.

For one-sweep caregivers, both the probit and logit models indicated no significant effects, suggesting that temporary caregiving does not harm employment trajectories or long-term outcomes for young people. However, the two-sweep, more-than-one-sweep, and three-sweep caregiving models require careful interpretation due to substantial differences between treatment and control groups, complicating the matching process. The combination of two- and three-sweep caregivers into the more-than-one-sweep category aimed to address these differences. The two-sweep models showed no

significant impact on employment for caregivers who provided care between ages 14 and 16. In contrast, the three-sweep models revealed significant effects, with the likelihood of being employed by age 25 reduced by 14.9% (at 5%) in the baseline probit model, while the logit model estimated a decrease of 12.2% (at 10%). In the RCM models, this reduction was estimated at 11.8% (at 10%), with a bias of over 9% between groups, while the logit RCM model estimated a reduction of 11.1% (at 10%) with a bias of 7.7%. Notably, the probit model showed a larger impact, estimating that three-sweep caregivers were 17.5% less likely to be employed and 14.3% less likely to be economically active by age 25 (both at 5%), although bias remained above 9%.

The combination of two- and three-sweep caregivers in the more-than-one-sweep models suggests a reduced likelihood of gaining employment by age 25, with reductions of 7.4% and 7.7% in the baseline models at (5%). In the RCM models, this reduction decreased to 5.6% and 6.7% at (10% and 5%), respectively. The likelihood of being employed at age 25 or being economically active at age 25 was reduced by 7.3% and 8.9%, respectively, in the probit model at (10% and 5%). However, the RCM models did not corroborate these findings. The logit model estimates that economic activity was reduced by 7.3% at (10% and 5%) in both the baseline and RCM models.

## 3.7 Possible policy interventions

This policy addresses three distinct parts. These are the employment and education of young carers, a debate around allowing children to provide care and the intervention of current formal carers.

### 3.7.1 Employment and education of young carers

To address the barriers to employment faced by young carers at ages 20 and 25, several key policy interventions are needed to support their transition into and advancement within the workforce. For some carers, particularly those in middle adolescence, caregiving responsibilities extend beyond the age of 16. A crucial intervention is the introduction of flexible employment programs. Policies that encourage employers to offer flexible work schedules, remote work options, and part-time employment opportunities would help young carers balance their caregiving responsibilities with work. This would reduce the strain of managing both roles and support carers in maintaining stable employment without compromising their caregiving duties.

Another essential intervention is providing targeted support for education and vocational training. Access to subsidised or free education, as well as flexible training programs, could help young carers develop the skills needed for career progression. Many young carers experience interruptions in their education due to caregiving responsibilities, so offering specialised support, such as adaptable study schedules or extended time frames for completing courses, would enable them to complete their education or vocational training while managing caregiving responsibilities. However, this support depends on identifying young carers and ensuring they have access to the necessary resources. The current transition from secondary school to college and then tertiary education, typically occurring at age 16, may be too restrictive for many carers. Given that compulsory education in the UK is now extended to 18, additional remedies may be required to ensure that no young carer leaves education prematurely without meeting the necessary academic standards.

Another area that warrants attention is the assessment of education. Many GCSEs are assessed on a bell curve, comparing students' results to those of their peers. This system may disadvantage young carers who experience disruptions in their education. To better accommodate young carers, alternative assessments, such as pass/fail qualifications that address essential literacy and numeracy levels, could be considered. This would help young carers gain qualifications that are recognised by employers, even if they faced interruptions during their schooling. The ability to read and write or do basic numeracy does not require a comparison with peers it is a binary outcome, pass or fail.

Financial assistance programs, such as caregiver allowances or subsidies, could also alleviate the financial burdens faced by or even resulting in young carers. These targeted financial supports would help carers manage their financial needs while ensuring they have the resources to focus on education or career development. For many children care happens because another parent has to go to work or because there is no other adult in the household. In particular, providing higher compensation for formal carers could help address staffing vacancies in situations where young carers are nearing key stages in their development. Additionally, ensuring access to affordable and reliable caregiving services is critical. Governments should invest in community-based caregiving services or subsidised home care options, reducing the caregiving burden on young carers. Access to these services would enable young carers to pursue education or employment opportunities without neglecting the care of their loved ones, thereby increasing their potential for economic independence. There is also a requirement to ensure that young carers are not a result of either a failing or failed health service. There may be caring situations as a result of failed community care or health services. For example, where heavy drug use or drinking has resulted in diabetes, amputations or psychological issues these children may be providing care because the interventions were not already in place many years ago. There are going to be many situations where children should be removed from the home environment and this is a trade-off that social services have to address but caring availability should be an element in this evaluation.

Mentoring and career counselling services specifically designed for young carers represent another important policy intervention. These services would provide guidance on career paths, job-searching, and navigating the workforce while balancing caregiving responsibilities. Mentorship programs, where experienced carers or professionals offer advice and support, could help young carers expand their professional networks and enhance their career prospects. However, these services depend on the timely identification of young carers and their needs. Raising awareness and reducing discrimination in the workplace are also vital components of any policy intervention. National campaigns could focus on educating employers about the unique challenges faced by young carers, promoting inclusive hiring practices, and fostering work environments that support carers. Encouraging workplaces to accommodate carers by offering flexible working hours or caregiving leave would create more equitable job opportunities. Moreover, young carers possess many skills and qualities that would make them valuable employees, such as dedication, resilience, and loyalty, which are often cultivated through their caregiving experiences.

Creating career development pathways specifically tailored to young carers would also be beneficial. Programs offering internships, job-shadowing opportunities, and work experience placements designed to accommodate the needs of young carers could help them develop the skills and networks necessary for career advancement. These initiatives would also raise awareness among employers about the challenges young carers face, fostering more inclusive recruitment and promotion processes.

Providing social support networks and peer groups for young carers is another important intervention. Facilitating connections with other carers would offer emotional support, reduce isolation, and provide shared resources. Peer groups could help young carers feel less alone in their experiences, offering valuable advice and encouragement as they pursue their career goals despite the challenges they face. Moreover, it is essential to address the role models and expectations surrounding young carers. Many young carers may not be aware of the opportunities available to them and may feel constrained by their caregiving responsibilities. Clear and accessible services should be in place to help young carers recognise that they have the potential to pursue different career paths and life choices, if they so desire.

Finally, ensuring access to health and well-being services is critical. The physical and mental health challenges that many young carers experience can hinder their ability to enter or remain in the workforce. Policies should include enhanced access to mental health services, stress management programs, and counselling, helping young carers manage the pressures of both caregiving and employment. Workplace wellness programs that recognise and support the unique needs of carers would also contribute to reducing stress and promoting long-term career success.

Through these policy interventions, young carers can be better supported in overcoming the challenges they face in entering and sustaining employment, ultimately leading to more equitable opportunities in the workforce.

### 3.7.2 The debate on whether we should allow young people to provide care

I admit that this debate has centred on those who do provide care in the family setting. However, what has been clear to me, and I hope the reader is the fact we allow young carers in the UK. There is extensive legislation around young people being employed the wages, hours and jobs they can do. However, many young carers will be doing excessive hours in the home that exceed those we allow adults to do in the workplace. There is a concern that many young carers are living in poverty, bad or no role models, they may even only have one parent, education levels in the home may be impacted and young carers may even be exploited.

The proposal to outlaw young carers, effectively preventing children and adolescents from providing care for family members, raises significant ethical, social, and practical concerns. Such a policy could theoretically be enacted by removing children from their homes and placing them under alternative care arrangements. This would involve interventions from social services and potentially foster care systems, which would place children in situations where they are no longer responsible for caregiving. While the intent behind such measures might be to protect young carers from potential harm and exploitation, there are serious potential negative outcomes that need to be carefully considered.

First, the removal of young carers from their homes could worsen the situation for both the children and the individuals they care for. For many young carers, caregiving is not only a familial responsibility but also an emotional bond. Removing them from their home environments could have profound psychological effects, including feelings of guilt, isolation, and loss. Additionally, the individuals being cared for (often parents or siblings with chronic illnesses or disabilities) would experience a further decline in their care, potentially leading to deteriorating health conditions. This could place additional strain on public care systems, as alternative caregivers would need to be provided, potentially exacerbating existing resource shortages. If formal care services were not available beforehand then this huge removal of informal carers is only going to make the situation worse.

Moreover, criminalising or outlawing young carers could push the practice underground, making it more difficult to address and support. Families may continue to rely on their children for care, but without official recognition or support, the practice would shift into informal, unregulated environments. This could result in young carers facing increased emotional and physical strain without the ability to access resources, guidance, or appropriate support services. For instance, young carers might not have access to respite care, financial aid, support, caring peers or educational accommodations, as their caregiving roles would no longer be legally recognised.

The underground nature of caregiving in such a context could lead to further risks for both the young carers and those they care for. Without oversight, it becomes more difficult to ensure that the caregiving responsibilities are being met in a healthy and sustainable manner. Young carers could experience burnout, mental health issues, and educational disruption, with little to no formal support. Families might be forced to hide their reliance on young carers, making it harder for authorities to intervene in cases of abuse, neglect, or other safeguarding concerns. Putting people off accessing support and medical intervention will exacerbate the situations.

Additionally, outlawing young carers would fail to address the underlying structural issues that contribute to the need for young people to take on caregiving roles in the first place. Many young carers are thrust into their roles because of insufficient access to professional care services, inadequate social support systems, or financial hardship. A policy that focuses on removing young carers from their homes without providing adequate alternatives for the families involved risks ignoring these root causes, perpetuating the cycle of disadvantage for vulnerable populations.

Finally, such a policy could also have unintended social and cultural consequences. For many families, caregiving is a deeply embedded practice shaped by cultural values and norms around family responsibility and support. By outlawing young carers, authorities could inadvertently alienate families and communities, leading to mistrust in social services and government institutions. Families may resist intervention, fearing that it disrupts their cultural and familial values, which could further marginalise them and make it harder to engage them in support programs.

Criminalising a very natural and pure human emotion is not emblematic of a functioning democratic and caring society,

### 3.7.3 Remedies for a more effective caring eco-system

The ideal model for care provision assumes that formal services are universally available to all who require them. However, this is not reflective of the current reality, where informal carers—often individuals with limited prior experience—are stepping in to fill the gap. These informal carers, which include young carers and children, frequently lack the training, knowledge, and resources to provide care effectively. This gap presents an opportunity for formal care providers or experienced carers to transfer their knowledge and skills to informal carers, thereby enhancing the quality of care provided and improving outcomes for those in need. While this model holds particular promise for young carers, who may face more pronounced challenges, its success depends on several factors, including the willingness of both care recipients and providers to engage in knowledge-sharing, as well as timely identification and communication by relevant authorities.

There is a potential risk that such knowledge transfer programs could detract from formal care services. However, the potential benefits mitigate these concerns. It could be achieved by integrating these initiatives into existing frameworks, such as respite care, peer support services, and informal care support groups. Local authorities should prioritise these services, as they can help extend the capacity of unpaid carers, potentially alleviating some of the pressure on formal care systems. While implementing such a model is undeniably challenging, the benefits could be considerable. By ensuring that young carers are equipped with the skills and resources they need, the strain on them could be eased, allowing for more leisure time, a reduced workload, and better overall outcomes for those receiving care, keeping them healthier and out of hospital. This type of involvement with experienced foster carers within a peer support environment has worked successfully to expand those providing foster care services and to benefit all those involved. In addition to knowledge transfers, it is critical to provide carers with practical resources, including extensive medical supplies, modern technology, practical guides and integrated medical devices such as glucose monitors, hoists and stairlifts, as well as an accessible supportive network. A key component of this support could include making available a free helpline for informal carers, which could offer real-time advice and guidance on a range of issues, including medication management and personal care instructions. Many young carers, in particular, face the challenge of having no accessible adult to turn to during unsociable hours or weekends. A dedicated helpline, similar to services like Childline, would fill this gap by providing confidential, 24/7 access to expert advice and signposting to appropriate services. The potential of such a helpline to alleviate the emotional, physical, and financial challenges faced by informal carers is significant, as it would offer them a crucial support system, reduce feelings of isolation, and improve their overall well-being.

Furthermore, a register of young carers, managed by a designated caseworker, could provide an additional layer of oversight and support. This would ensure that carers receive appropriate guidance, resources, and referrals when needed, and could facilitate a more coordinated approach to care provision. While the implementation of these services would require careful planning and investment, their potential to improve the quality of care and the well-being of informal carers cannot be overstated. There are likely to be significant resistance by those receiving care, but like schools have a duty to report suspicious behaviour regarding sexual and physical abuse, schools should also be compelled to identify and report their suspicions of children under their care providing care themselves. This should not be criminalised or seen as a way for children to be taken away from their families but a way for support and identification shared among all partners where this may be beneficial. This should not only be a role for schools but all of those partners who engage with children and those requiring/receiving care. The NHS, social services, schools, police, local authorities, fire services and public services. This is already active with regard to sexual exploitation, domestic violence, radicalisation, drug use and poverty. These are not perfect and people will still evade identification through their own efforts but also by "falling through the cracks" wherever administration is involved.

## 3.8 Conclusion

In this paper, I have examined the medium-term impact of caregiving during middle adolescence on economic outcomes, utilising data from the NextSteps cohort study. Young carers under 18 years old are unfortunately a necessity in the UK. This is endemic of our failing public services and issues around funding and employment in the social care sector. I am grateful to all participants for their contributions to this research. The analysis reveals notable differences between individuals who provide care and those who do not, particularly in relation to the household environment and parental factors. These differences highlight the potential for selection bias, which was addressed through the application of propensity score matching. This methodological approach is crucial for controlling for confounding factors, where the home environment influences both caregiving responsibilities and economic outcomes.

To enhance the validity of the results, I incorporated varying caregiving patterns between ages 14 and 16, including temporary care episodes (one-sweep carers), extended care episodes (two-sweep carers), and long-term care episodes (three-sweep carers). Challenges related to sample size in the two-sweep and three-sweep carer groups were mitigated by combining these groups into a "more-than-one-sweep" carer sample. However, concerns about the methodology persist, as distinct differences remain between carers and non-carers. Notably, one-sweep carers, the largest subgroup, appear unaffected by caregiving in terms of economic outcomes. When focusing solely on carers versus non-carers, the data show that, by age 25, carers are between 2.9% and 4.4% less likely to have gained employment, 4% to 5.6% less likely to be employed, and 3.8% to 6% less likely to be economically active (either employed or in education) at age 25. These results provide the strongest match, with reductions in bias and a high retention rate of individuals across the carer models.

In contrast, two-sweep carers show little significant economic differences compared to non-carers, although issues with bias reduction and sample matching remain. There is some evidence that 2 sweep carers are 12.8% to 14.9% less likely to be employed at age 20 and between 7.7% and 9.8% less likely to be economically active at age 25. The three-sweep carer models, which include individuals with consistent caregiving responsibilities, demonstrate more substantial barriers to employment, with reductions

in employment rates ranging from 11.3% to 14.9%. In the baseline models, the likelihood of being employed at age 25 is reduced by 17.6%, and the likelihood of being economically active at age 25 is reduced by 14.3%. The challenges around sample size, bias between the groups and sufficient matching were addressed by combining the two- and three-sweep carers into the "more-than-one-sweep" carer sample, where the barriers to employment were consistent, with reductions ranging from 5.3% to 8.6%. For employment and economic activity at age 25, the reductions ranged from 7.3% to 7.5% and 6.4% to 8.9%, respectively. These models proved to be the most effective at reducing bias in the multiple caregiving episode samples.

Interestingly, across all models, young carers do not appear to face any reduction in earnings at age 25. This lack of earnings disparity may reflect early career stages, such as completing university or entering entry-level positions, where differences between carers and non-carers may be less pronounced. However, this outcome is likely to become more significant as individuals progress in their careers and reach higher income levels. This presents an avenue for future research, particularly as the survey continues to track individuals into their 30s and 40s, where long-term effects may become more evident. Whilst carers in general show signs of economic harm into their 20's this is mainly focused on the intensive carers. Overall, it is ultimately a combination of providing care, their home environment and society that causes these individuals to be worse off than their non-caring counterparts. The human characteristics of carers is likely to express the desired qualities by most employers.

The clear characteristic differences between carers and non-carers creates issues when using propensity score matching. It relies on sufficient overlap and a suitable number of matches. Our baseline 1 to 1 matching should be considered the main results. However, when using radius caliper matching there are some issues with the subsequent matches, despite reducing the bias between these groups the quality of matches may present further issues with the density and quality of matches. With some individuals being dropped who are outside of the defined caliper distance. There is significant trimming of the propensity scores and therefore 1 to 1 matching may be the more robust method. Further information on the matching, propensity scores and model specification diagrams are included in the following appendix.

# 3.9 Appendix – Chapter Three

### 3.9.1 Regressions

### Table 3.9.1-1: Likelihood to be a carer - regressions

Variables	Carers	1 Sweep	2 Sweeps	>1 Sweeps	3 Sweeps
Male	043	.003	144	121	024
	(.062)	(.072)	(.099)	(.088)	(.135)
Female parent Professional and skilled	149	196	299	138	2.990
	(.254)	(.286)	(.376)	(.368)	(113.844)
Female parent unemployed	091	208	143	.013	3.040
	(.251)	(.284)	(.368)	(.361)	(113.844)
Female parent unskilled	132	206	240	078	3.031
	(.247)	(.278)	(.364)	(.357)	(113.844)
No Male Parent	.207*	.077	.435**	.399**	.233
	(.112)	(.129)	(.181)	(.162)	(.262)
Male parent unemployed	.479**	.338	.719***	.673***	.389
	(.187)	(.217)	(.265)	(.243)	(.397)
Male parent unskilled	.007	021	.02	.048	.099
	(.105)	(.119)	(.182)	(.159)	(.245)
Male parent Skilled trade	.072	014	.148	.204	.270
	(.102)	(.117)	(.175)	(.150)	(.224)
Male has a degree	109	232**	.213	.140	048
-	(.093)	(.109)	(.146)	(.130)	(.218)
Female has a degree	030	043	01	007	023
	(.084)	(.097)	(.134)	(.119)	(.189)
Female is disabled	.737***	.403**	.487**	.895***	1.240***
	(.146)	(.192)	(.218)	(.169)	(.213)
Male is disabled	.304*	.318	.130	.228	.416
	(.181)	(.207)	(.263)	(.237)	(.361)
Zero siblings	693***	834***	464***	427***	226
	(.118)	(.151)	(.169)	(.150)	(.234)
One sibling	406***	334***	461***	441***	318
	(.098)	(.114)	(.149)	(.134)	(.215)
Two siblings	006	.067	147	129	054
	(.100)	(.115)	(.151)	(.137)	(.219)
HH income max Up to £20,799	.138	.157	.078	.083	.085
	(.112)	(.130)	(.181)	(.160)	(.256)
HH income max £20,800 - £36,399	.107	.061	.139	.155	.200
	(.087)	(.099)	(.144)	(.127)	(.200)
Zero additional adults	012	.115	183	154	042
	(.092)	(.113)	(.132)	(.120)	(.197)
One additional adult	014	.114	240*	174	.008
	(.096)	(.117)	(.141)	(.126)	(.201)
Intercept	-1.013***	-1.228***	-1.472***	-1.556***	-5.404
	(.288)	(.327)	(.430)	(.412)	(113.844)
Observations	3345	3215	3088	3129	3040
Notes: Standard err	ors are in nare	entheses. *** n<	.01. ** n<.05. *	n<.1	

Table 3.9.1-1 provides the regressions for modelling the likelihood to be a carer or the iterations of care discussed Table 3.4.7-1, dependent on the variables discussed in Table 3.4.3-1. The results suggest that the absence of a male parent increases the likelihood of caregiving responsibilities across all carers, including those with two or more caregiving episodes. This pattern is similarly observed when the male parent is unemployed. These

findings indicate that both the absence of a male parent and the presence of an unemployed male parent contribute to an increased caregiving burden in two main ways. First, the absence of a male parent may lead to a greater caregiving workload for children, potentially reflecting a family situation where marriage breakdowns or the caregiving needs of a female parent (due to work or disability) shift the responsibility to the next oldest individual. Second, an unemployed male parent could suggest that the male parent is ill, requiring the female parent to either assume additional caregiving duties or work to compensate for lost income.

Female disability is consistently associated with an increased likelihood of caregiving. The dynamics in this scenario are similar to those discussed previously, where financial constraints lead children to provide care, enabling the male parent to continue working. Finally, the model for carers with three caregiving episodes demonstrates some signs of inaccuracy, likely due to the small sample size of only 41 carers, which may explain the unusually high coefficients observed in this model.

### 3.9.2 Matching propensity scores – densities before and after

The proceeding section displays the propensity score density before matching and then subsequently matching 1 to 1 with replacement. Initially these are for carers and non-carers in Figure 3.9.2-1, one sweep carers: Figure 3.9.2-2, two sweep carers: Figure 3.9.2-3, more than one sweep carers: Figure 3.9.2-4 and finally three sweep carers: Figure 3.9.2-5. It should be clear that pre matching there is a significant skewness of the non-caring sample to the left of the graph however the matching significantly brings the propensity scores in line with the caring sample in the left-hand graphs.



Figure 3.9.2-1: Propensity score density plots carer vs non carers

Figure 3.9.2-2: Propensity score density plots one sweep carer vs non carers





Figure 3.9.2-3: Propensity score density plots two sweep carer vs non carers

Figure 3.9.2-4: Propensity score density plots more than 1 sweep carer vs non carers





Figure 3.9.2-5: Propensity score density plots three sweep carer vs non carers

3.9.3 Propensity scores carers

Figure 3.9.3-1: Logit and probit propensity scores by caring type





Figure 3.9.3-2: Logit and probit propensity scores by caring type - one sweep

Figure 3.9.3-3: Logit and probit propensity scores by caring type-two sweeps





Figure 3.9.3-4: Logit and probit propensity scores by caring type - more than one

Figure 3.9.3-5: Logit and probit propensity scores by caring type-three sweeps



3.9.4 Propensity score overlap - carer



Figure 3.9.4-1: All Carer propensity score overlap

Figure 3.9.4-2: One sweep carer propensity score overlap





Figure 3.9.4-3: Two sweep carer propensity score overlap

Figure 3.9.4-4: More than 1 sweep carer propensity score overlap





Figure 3.9.4-5: Three sweep carer propensity score overlap

End of Chapter Three

## 4 Thesis conclusion and future research

A shift in demographics is underway in many modern economies. Life expectancies have increased, whilst these are inherently good, they don't account for the reduction in independence that runs parallel with aging. Formal care services in the UK are expensive, publicly funded in the majority and face significant issues in attracting labour and retaining that labour. This issue requires a thorough understanding of the economic climate, local authority finances and a serious and uncomfortable dialogue with the general public. As it currently stands, the majority of social care is provided by unpaid carers in the community. However, public finances are poor, living costs have soared and the tax burden is at the highest point in decades.

The transition from single-income to dual-income households is a significant socioeconomic shift that has reshaped family dynamics and labour market structures over several decades. Historically, many families operated on a one-income model, with the male head of household typically serving as the sole breadwinner. This structure was largely supported by industrial economies, where stable, well-paying jobs in manufacturing provided enough income to support an entire family. However, several key factors have driven the shift toward both parents needing to work. Economic pressures, such as rising living costs, stagnating wages, and the decline of traditional manufacturing jobs, have made it increasingly difficult for a single income to sustain a household. In parallel, social changes-including advancements in gender equality, increased access to education and employment opportunities for women, and evolving cultural norms—have contributed to women's expanded participation in the workforce. This shift has led to the normalisation of dual-income households, which, while providing economic benefits, has also introduced new challenges related to the distribution of unpaid care work, highlighting the need for policies that support both paid employment and caregiving responsibilities within the modern family structure.

The provision of informal care, often performed by family members, primarily women, has significant socio-economic and psychological implications that are critical to understanding the complexities of modern labour and family dynamics. Informal care refers to the unpaid caregiving provided by family members or friends to individuals who are elderly, disabled, or ill. This form of care has long been an integral part of family and

**Thesis Conclusion** 

community life; however, its increasing demand and the pressures it places on caregivers have raised important questions about its economic and social consequences.

From an economic perspective, informal care is often seen as a form of invisible labour. It is not compensated, nor is it fully accounted for in traditional measures of economic output, such as Gross Domestic Product (GDP), despite its significant contribution to maintaining the well-being of dependent individuals. In many cases, caregivers may reduce their working hours or leave paid employment entirely, leading to loss of income, career stagnation, and diminished economic independence. This not only impacts the caregivers' financial stability but also reinforces gender inequalities, as women disproportionately provide informal care, further entrenching traditional gender roles and limiting their economic mobility. The "care penalty," a concept used in feminist economics, refers to the long-term economic disadvantage experienced by those who take on caregiving roles, especially in terms of lower wages and reduced career opportunities.

Socially, the reliance on informal care creates a complex intersection of family responsibilities, gender expectations, and policy gaps. In many societies, caregiving is still predominantly viewed as a private, familial responsibility, and as a result, formal support systems such as public childcare, eldercare services, and paid leave remain insufficient or inaccessible. This leads to an unequal distribution of care work, where women, particularly those in lower-income or minority communities, bear the greatest burden. The lack of institutional support can also lead to caregiver burnout, mental health challenges, and social isolation, as caregivers often struggle to balance their caregiving responsibilities with other aspects of their lives.

Psychologically, caregiving can be both rewarding and emotionally taxing. While caregivers often experience a sense of fulfilment from providing care to loved ones, they may also experience stress, anxiety, and depression due to the physical and emotional demands of the role. The constant need for emotional labour, the long hours spent caring for others, and the lack of respite can contribute to caregiver fatigue, which not only affects the caregiver's well-being but can also impact the quality of care provided to the care recipient. These psychological burdens are often overlooked in discussions about informal care, making it crucial to incorporate mental health support and coping strategies into caregiving frameworks.

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The implications of providing informal care thus extend beyond the individual caregiver and care recipient to impact broader societal structures. These implications underscore the need for policy reforms that recognise the value of informal care and provide adequate support. Measures such as paid family leave, subsidies for caregiving services, and greater access to affordable healthcare are essential to alleviating the strain on caregivers and addressing the gendered nature of unpaid care work.

I discussed these in the first chapter of this thesis. I then used this understanding as a platform in chapter 2 to evaluate a significant piece of legislation aimed at those who provide unpaid care. The Care Act was introduced at a time when there was and still remains a significant financial flux post 2008. The impact of this will be increasingly evident in the current climate with the war in Ukraine and the middle east increasingly adding to the economic shocks and instability. The cost-of-living crisis in the UK puts further pressures on families and individuals particularly finances. There are also changing family dynamics changing the traditional supply of informal carers. However, the act appeared to marginally increase carer uptake but the sustainability of this will require further analysis in the years to come. Carer retention appeared to be the bigger beneficiary of the legislation, but I suspect a significant aim of the act was to address informal care from a broad range of demographics and situations. Public health and innovative ideas will be required to reduce the demand for social care in general. There still remains a significant cost to individuals to provide informal care and this may be the largest factor limiting the numbers of people providing care.

Innovative ideas on policies, tax breaks and funding will be required to alleviate many of the concerns and implications identified in this thesis. These are of course areas that can be addressed in future research. Building on the literature on carer uptake and decisions of those families faced with these situations would require field work and direct in the community setting involvement. A framework to understand the trade-offs would require a microscopic, individualised analysis, costly but this may be beneficial in furthering the understanding of policy makers and academics.

In my final chapter I looked closely at the implications of individuals who provided informal care in middle adolescence. This is an overlooked cohort in the current economic literature, but I believe one in which will grow significantly as the financial crisis bites, more children are likely to be absorbed by families to mitigate these financial situations. The biggest risk to those young carers is twofold. In one direction there is a risk that they will have to continue to provide informal care into their twenties and thirties. As this thesis has identified, young carers often face significant challenges in balancing their caregiving responsibilities with their own educational and developmental needs. The impact of this dual burden can be far-reaching, contributing to social isolation, mental health difficulties, and disrupted educational attainment. Despite the critical role that young carers play in providing informal care, their needs are frequently overlooked, both in policy and practice. Secondly young carers may not be able to obtain a second opportunity. For many young people, especially those who have faced caregiving responsibilities or other challenges, returning to education after leaving school is a difficult and often discouraging task. Emotional barriers, such as feelings of inadequacy and missed academic milestones, can undermine their confidence. Additionally, financial pressures, adult responsibilities, and a lack of flexible educational options further complicate re-engagement with learning. Limited access to support systems, mentorship, and tailored programs can make the transition even harder. Without accessible and supportive pathways, many young people find it nearly impossible to pursue further education, leaving the opportunity for a second chance out of reach.

Further research should focus on understanding the long-term effects of caregiving on young people, as well as exploring effective interventions that can support them without compromising their well-being or future prospects. Additionally, there is a need for comprehensive policies that recognise and address the specific challenges faced by young carers, ensuring they have access to the resources, education, and emotional support necessary for their development. As society continues to rely on informal caregiving, the experiences of young carers must be better understood and integrated into broader discussions about caregiving, family support, and youth development. Returning to this cohort and dataset is one I will perform. As the cohort ages richer information and prolonged and extended data will further the understanding of young carers but also address the validity of the results in this paper but at several life stages.

In looking at informal care but social care in general, a significant part of this thesis was in the construction of a rich longitudinal dataset focused on the children's care home market in England spanning over a decade. This was done solely by me, manually with no outside input over 12 months. Disappointingly, econometrically the progress was slow and required significant work and likely external collaboration. This will be the focus of my immediate career post PhD. This will require better access to local authority information and statistics that may require additional administration to overcome substantial hurdles to obtain this information. The aim of this study was to assess the impact of competition, homeownership structure, type, and density on Ofsted ratings, as well as competition dynamics, home entry and exit patterns, and local market trends. Additionally, the focus would also be on analysing the cost to local authorities, the balance of demand and supply within the local market, and the stability of homes. The residential children home market has experienced significant volatility since the 1990's with an influx of private equity, increased demand for places in both numbers and severity. Traditionally the residential children's home market was dominated by publicly run homes by the local authorities themselves and charitable organisations. However, since the latter part of the 20<sup>th</sup> century, privately owned homes are now the largest contributor to the sector with increasingly concentrated areas, which has seen local authorities raise these concerns with competition regulators. Resulting in the Competition and Markets Authorities to lead an investigation along with a handful of academics who are focusing on this field.

I would like to thank the datasets used in this thesis. These have been used extensively by many researchers and will continue to do so in future. To aid the work of those in informal care, myself included these datasets should implement more questions with this focus in mind. Of course, many researchers will be fighting for their own specific questions to be included but a richer dataset with more questions will aid in the research of informal care.

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