International Journal of Population Data Science

Journal Website: www.ijpds.org

Co-resident grandparent and maternal employment. A Northern Ireland cross-sectional administrative data analysis

Ana Corina Miller[1,*], Dermot O'Reilly[2], and David Wright[2]

Submission History

Submitted:	09/02/2024
Accepted:	24/06/2024
Published:	09/10/2024

[1]Department of Economics, Queen's Business School, Queen's University Belfast
[2]Centre for Public Health, Queen's University Belfast

Abstract

The trade-off between the costs of childcare provision and the benefits of having an increased proportion of women, particularly women with dependent children, in employment is one of the most taxing social issues for Western governments. In countries like Northern Ireland, the limited subsidised childcare provision for preschool and primary school children has been partially offset by a rise in informal childcare though this has been considerably hard to assess both in terms of magnitude and effect. Using the entire 2011 Census cohort of mothers with children aged 1 to 16 years of age, we argue that co-resident grandparents have a substantial positive impact on maternal labour force participation in Northern Ireland. The presence of a co-resident grandparent was associated with an increase of 3.7 percentage points in employment for single-parent mothers and 2 percentage points for mothers in two-parent households. Mothers with co-resident grandparents report an increase of 2.7 percentage points for a single mother and of 3.7 percentage points for a mother in a two-parent household being in full-time employment than mothers without. Overall, the presence of a co-resident grandparent was associated with at least a 3.2 percentage point increase in labour force participation among mothers with primary-school-age children.

Keywords
maternal employment; childcare provisions; administrative data

*Corresponding Author:
Email Address: a.miller@qub.ac.uk (Ana Corina Miller)

https://doi.org/10.23889/ijpds.v9i1.2143

Introduction

This paper explores how co-resident grandparents relate to maternal employment in one of the UK regions, Northern Ireland. Encouraging women's labour force participation is important to sustainable economic development, especially in economies with highly educated women and an ageing population. Although in the last decades, there has been an increase in women's labour force participation across Europe, there is still a considerable gap between the employment rates of men and women, 10.7 per cent at the EU level in 2022. Recent data show a substantial gender employment gap in NI. Over the last ten years, employment levels for women in Northern Ireland (NI) have grown from 63 per cent in 2012 to 67 per cent in 2022 (+3.9 percentage points), but this remains lower than overall UK levels in terms of both employment levels (72 per cent) and employment growth (+5.9 percentage points).

Although women are in increasing numbers in full-time employment over their lifecycles, they still face considerable barriers to the labour market and career progression that do not apply to men. Parenthood affects men's and women's employment unequally, as women are more often involved in childcare, care and or family duties. Evidence shows women with children suffer large pay penalties, and taking time out of the labour force or returning to work part-time may be damaging to career progression [1–3]. The employment path women follow in the years after childbirth has important implications for women's labour market outcomes, women may take up jobs with lower occupational status than those they held previously and or work part-time with an impact on their careers and long-term pay compared with those of childless women or men. The literature related to women's employment after childbearing is broad and very much a contemporary academic debate topic. The competing demands of work and family responsibilities for women may be greater in some jobs than others, while mothers' *decisions* to work may also be influenced by 'ideals of care', which are societal expectations and values in relation to child-rearing [4]. Recent research [5] shows that policies that allow women, especially, to balance work and family responsibilities when their children are young, therefore providing a lifetime history of paid work remains a good predictor of later-life employment, an important aspect given the ageing population and the continuous increase in the state pension age.

Widely available and affordable or subsidised childcare encourages the participation of women in the labour force though this varies between countries, mostly depending on the entitlement to childcare subsidies and the difference in enrolment in pre-school age. For example, [6] in the USA, [7] in Quebec, Canada, [8] in Sweden, [9] in Norway, and [10] in the Netherlands, all report increases in mothers' labour force participation after the implementation of affordable childcare policies. However, this is still subject to active debate. [11] and [12] find increasing the number of hours of free childcare to cover a full school day leads to significant increases in the labour supply of mothers in England, while [13] using UK data, found childcare prices have a negative effect on mothers' probability of working and on using formal childcare provision. Although the reduced availability or high cost of childcare services can disincentive mothers from returning to work, even in a dual-earning household, these effects are more acute for single parents and low-income families. [14], for example, found that the investment into free day-care in Germany had little effect on maternal labour supply, though it had strong positive effects on poorer and other vulnerable households. Similar results are found by [15] In Ireland, where childcare costs act as a barrier to employment for households with lower income.

In the UK in recent years, the early learning programmes offered by the four different governments are generally becoming more flexible and oriented towards the needs of working parents with children of pre-school age. In England for example, the government has introduced on top of the 30 hours a week free childcare for three and four-year-olds, 15 hours free childcare a week for two-year-olds from April 2024; 15 hours free childcare for nine-month-olds from September 2024 and 30 hours free childcare for all under-five from September 2025, [16]. Wales and Scotland's early learning programmes are relatively similar with England [17, 18] while the situation for working parents in Northern Ireland is bleak. The early learning programme in Northern Ireland [19] offer no flexibility in timetabling of the weekly only 12.5 free hours for children of pre-school age or in the choice of provider[1]. This rigidity makes it more difficult for working parents to avail of the benefits of the programme and in some cases more expensive as they will have to supplement this free care with half-day nursery or childminder costs, typically more expensive than a full day [20].

Informal childcare may be another option available to the mother. Usually provided by the grandparents and unlike formal childcare, most of the time, without a financial cost to the mother. Research on the impact of informal childcare provided by grandparents on maternal employment is scarce, though the general conclusion suggests that it increases women's labour force participation, [21–25]. In particular, the provision of regular grandchild care may facilitate labour force participation among the lower-educated women with younger children [26]. A large cross-national study using data from 10 European countries, [27] indicates a complementarity between formal and informal care; grandparents are generally more likely to provide intensive (e.g. daily) childcare in countries with limited childcare facilities, and as formal childcare use increases, the childcare provided by grandparents decreases. The lack of publicly available childcare provisions lowers mothers' employment as she is engaged in the full-time care of her children hence there is limited need for grandparental childcare; if the mother is taking employment she must rely on the daily support of grandparents' childcare, a substitute to the lack of formal childcare facilities. The reverse is observed when formal childcare is widespread, as women are more likely to be employed and might need grandparents to complement formal care occasionally, i.e. extensive grandparental childcare [28, 29]. Similar results are found by [30] and [31]. The quality of childcare facilities is also very important; [32] show that

[1] In Northern Ireland, children of pre-school age are children aged three and in some cases, children aged at least two. This entitlement is spread equally over the 5 working days a week during term time, are provided only by nursery and primary schools with nursery units and some voluntary and private providers excluding childminders, subsidised by the Department of Education, and regarded as early year's education and not childcare places.

labour force participation only increases in the presence of good quality childcare and discuss the complementary forms of childcare provisions and employment patterns in Britain; [33] found that the poor quality provision increased the amount of informal childcare provided by grandparents. [34] found that helping parents to go to work, is one of the most often reported reasons for grandchild care provision. On the other hand, households with co-resident grandparents are associated with socio-economic disadvantage [35] and more frequent grandparent childcare provision has been found in families where parents are either in low-paid, insecure jobs or had fewer economic resources [26, 36, 37]. On the other hand, (Kanji 2018) found that 45% of single mothers and 39% of partnered mothers rely on grandparental childcare to return to work, which is not that much of a contrast between the two types of households.

This paper provides a first glance into the impact informal childcare provided by co-resident grandparents has on mother's employment rates in Northern Ireland. We explore the individual and household characteristics most relevant to the mother's employment opportunities, given the age of the children (pre-school, primary school, and post-primary school age). The paper examines (i) the association between the presence of a co-resident grandparent and maternal employment both for single-parent and two-parent households; (ii) the impact of co-resident grandparents on a mother's full-time and part-time employment, considered in the literature as vital for women in managing both family and work; and (iii) how these relationships are affected by the health of the co-resident grandparent.

Methods

In this empirical analysis, we used the entire population enumerated in the 2011 Census for Northern Ireland[2]. The use of population-wide data is a vital and rich source of information that can contribute to academic research and policy decisions. One could argue this analysis might be considered outdated given the economic and social policies that have been implemented since the 2011 Census. However, as discussed in the introduction, formal childcare in Northern Ireland is still provided by the market and with the cost of childcare rising and substantially the highest cost a household with children is facing, the use of this data in this analysis is suitable as the structure and composition of the household has not changed over the time and the complexity of the population data enables fine-grained analysis of the net effects. The unique resource provides population-wide data relating to mothers and their household circumstances and composition, including the presence of children and co-resident grandparents. All women aged between 20 and 60 inclusive were included in the study. Teenage mothers, 15-19 years of age, were not included as earlier research demonstrated that they were more likely to be still in school and living with their parents [38]. The choice of upper age limit was driven by the state pension age, 60 years of age for women in 2011[3].

All the maternal attributes included in the study were based on known or suspected factors related to the likelihood of engagement with the labour market and decisions about childcare. As the latter is based on the quality, availability, and cost of childcare in the area, as well as on the family practice and the norms in their region of residence, a set of dummy variables representing the country of birth (Northern Ireland, Great Britain and Ireland, and EU and other countries) and area characteristics were included in the analysis. Maternal attributes included age (10-year age bands, 20-29, 30-39 etc.), educational attainment (tertiary, secondary, no qualifications), and religious affiliation (Catholic, Protestant, no religion/other), included due to the historical employment differences between Catholics and Protestants in NI [39]. Ethnic background was not included as Northern Ireland is ethnically homogeneous. Health has a major influence on labour force participation, hence maternal health was measured using a Census question, which asked if people had *a "health problem, or disability, which limited day-to-day activity a little, or a lot and had lasted, or was expected to last, at least 12 months"*. Women are known to be the main care providers for family members and friends [40] and caregiving is expected to have a negative effect on the mother's labour force participation. Caregiving responsibilities (none - non-caregiver, caregiving for 1-19 hours, 20-49 hours, and 50 or more hours per week) were derived from the Census question: "*Do you look after, or give any help or support to family members, friends, neighbours or others because of either: long-term physical or mental ill-health/disability; problems related to old age?*". The respondents were instructed not to include anything they did as part of their paid employment and was not possible to identify the caring recipient.

The Census relationship matrix allowed the reconstruction of household structure and relationships, the number of children in each family, and stratifying the population into single and two-parent households based on stated marital status and overall family structure. The number of children under the age of 16 (including stepchildren) were included in the analysis, along with three indicators of age groups: at least one child of preschool age, (1 to 4 years old), at least one child of primary school age (5 to 11 years old) and at least one child of post-primary school age (12 to 16 years old) per household to explore whether there was variation in mothers' employment by age of child. We also include three separate dummy variables identifying only households with children of preschool age, primary school age and post-primary school age and stratified by type of household to further explore mothers' employment patterns. We excluded mothers with children younger than 1 for two reasons; firstly, it is recognised that these very young children are under-recorded in the census but more importantly this post-natal period is considered as Statutory Maternity Leave (SML) if the mother had been employed at the time of pregnancy. We acknowledge that not all mothers avail of the full 52 weeks of SML, but a more accurate distribution of SML for our population was not available.

[2]The 2011 Census for Norther Ireland has an estimated completion rate of 92% with records for 1,657,897 individuals (after dropping individuals living in communal establishments (19,960)), of whom 435,493 were aged 0 to 19; 312,764 were aged 61 and older and 909,640 were aged 20 to 60 years old.

[3]Up to 5 April 2010 the State Pension age was 60 years for women and 65 years for men, but after this date, women's State Pension age will gradually rise until it reaches 66 years in 2020.

All fathers in the two-parent households were included in the analysis alongside a measure of their educational attainment. Given the 10% wage gap between men and women (OECD 2019), we used the father's level of education as an indicator of potential income[4]. The relationship matrix determined the presence of co-resident grandparents while their health status was assessed using their responses to the same activity limitation question. Twenty-eight households with 3 and 5 co-resident grandparents were excluded due to non-response (missing/edited) information and inconsistency in the dataset, hence, only households with one and two co-resident grandparents were used in the analysis. When two co-resident grandparents were present in a household, their mean health was used to allow for a consistent measure of grandparents' health between households. We did not stratify on either maternal or paternal grandparents as this information is not available in the census, but we control for grandparents' gender, as grandmothers tend to be more involved in caring for and helping with their grandchildren [34], and if the co-resident grandparent is active in the labour market.

As household income and the cost of childcare are important determinants (but not available in the Census) in mothers labour force participation, two socio-economic variables, the number of cars in the household (grouped as no cars, one, two or more cars) and housing tenure (owner, private renting, and social renting) were used as proxies for household wealth. Each household's geographical location was further classified according to an indicator of urban-rural residence, and this was based on a classification of Settlements [41], grouped as urban, intermediate and rural locales representing settlements of >75,000 people, 2500–75000 and <2500 people, respectively. Individuals with non-response (missing/edited) labour market outcomes (n = 29), and individuals living in communal establishments (n = 19,960), were dropped. A total of 195,922 mothers with children aged 1 to 16 years of age were used in the analysis for this paper; 58,007 lived in single-parent households with the rest (n = 137,915) in two-parent households. The total number of individuals included in the analysis was 467,853.[5]

For this study cohort, a descriptive summary for all covariates is first presented and discussed followed by several regression models to examine the probability of maternal employment after childbirth. We employ probit models which involve the binary choice of whether a mother is employed or unemployed and assess the impact of personal, household, and other characteristics on the probability of maternal employment. These models are widely used in the labour market literature to understand the impact of various factors and address issues such as endogeneity and sample selection bias. The mothers' employment status was defined as employed or not and further dichotomised into full and part-time employment, representing 31 hours and over, and up to 30 hours per week, respectively. Consequently, multinomial logit models were used to assess individual labour market characteristics. Multinomial logit models account for this heterogeneity by allowing for a detailed examination of how various factors influence multiple employment categories.

[4]Fathers' employment status was explored but as we have full employment in this sample, the analysis was not pursued.

[5]The resulting linked data were anonymised, held in a safe setting by the Northern Ireland Statistics and Research Agency (NISRA) and made available to the research team for the purpose of this study, only. The research was approved by the Research Ethics Committees (Queen's University Belfast, School of Medicine, Dentistry and Biomedical Sciences Research Ethics Committee).

Results

Table 1 presents the distribution of the main variables by type of household as well as by the presence of coresident grandparents in the household. Within the 2011 Census population aged 20 to 60 years, 70.4% of women and 76.2% of men were employed; 4.0% of women and 8.2% of men were unemployed; 9.6% of women and 1.4% of men were looking after family and home; 8.4% of women and 7.9% of men were long-term sick, and 7.6% of women; and 6.3% of men were retired, students or other. Out of our population of mothers aged 20 to 60 with children aged 1 to 16 years, 29.6% (58,007) were in single-parent households and 70.4% (137,915) in two-parent households; 7.9% (4,607) of single-parent households had at least one coresident grandparent compared with 2.2% (2,976) of a two-parent household. A greater proportion of single mothers were in employment where a co-resident grandparent was present (71.0% vs. 53.6%) but no noticeable differences between two-parent, households with or without co-resident grandparents.

Single mothers with co-resident grandparents are younger and more likely to be Catholic, with no activity limitation, live in urban areas, and are homeowners (72.5% vs. 34.7% of households with no co-resident grandparents). It is not possible to ascertain whether the mother owns the house or lives in the house owned by her parents (the grandparents in this paper). Also, there were no clear differences in caring responsibilities given the presence of grandparents within single-parent households.

Within households with two parents, there were few differences between those with and without a co-resident grandparent. Though mothers with a co-resident grandparent were engaged in significant levels of caregiving (defined as more than 19 hours per week), we could not determine whether the caring is for the grandparent, for another family member such as a child or partner or if they were caring for someone outside the family.

Mothers in single-parent households have lower levels of education attainment and live in social housing and urban areas than those in two-person households. Half the single-parent households with co-resident grandparents had access to two or more cars, compared with only 8% of the households without and there was a greater proportion of single-parent households with no car access (with or without a co-resident grandparent) compared with two-parent households. A greater proportion of single mothers with no co-resident grandparents reported some level of poor health (activity limited a little or a lot) in comparison with all other groups.

Co-resident grandparents living in a two-parent household report a higher level of poor health, 32.4% vs. 23.1% of those living with single mothers, perhaps also because the latter are a younger cohort. More so, almost 30% of the co-resident grandparents living in a two-parent household are 70 years of age or above compared with 16.3% living with single

Table 1: Background characteristics of households with and without a co-resident grandparent stratified by single and two-parent households

	Single-parent household		Two-parent household	
	Co-resident grandparent No. (%) households			
	No	Yes	No	Yes
	53,400(29.6)	4,607(7.9)	134,939(70.4)	2,976(2.2)
Mother's employment				
Not employed	24,754 (46.4)	1,337 (29.0)	33,625 (24.9)	786 (26.4)
Employed	28,646 (53.6)	3,270 (71.0)	10,1314 (75.1)	2,190 (73.6)
Mothers age group				
20-29	15,119 (28.3)	2,493 (54.1)	15,005 (11.1)	526 (17.7)
30-39	19,645 (36.8)	1,490 (32.3)	55,219 (40.9)	1,061 (35.7)
40-49	16,001 (30.)	563 (12.2)	54,811 (40.6)	1,103 (37.1)
50-59	2,635 (4.9)	61 (1.3)	9,904 (7.3)	286 (9.6)
Mother's education				
Tertiary	8,236 (15.4)	962 (20.9)	52,299 (38.8)	936 (31.5)
Secondary	32,166 (60.2)	2,914 (63.3)	69,095 (51.0)	1,608 (54.0)
No qualification	12,998 (24.3)	731 (15.9)	13,545 (10.0)	432 (14.5)
Mother's religion				
Catholic	25,382 (47.5)	2,533 (55.0)	6,1361 (45.5)	1,400 (47.0)
Protestant	19,816 (37.1)	1,448 (31.4)	62,229 (46.1)	1,236 (41.5)
No reg Other	8,202 (15.4)	626 (13.6)	11,349 (8.4)	340 (11.4)
Mother's country of birth				
NI	46,831 (87.7)	4,201 (91.2)	113,019 (83.8)	2,350 (79.0)
GB and ROI	4,166 (7.8)	208 (4.5)	11,498 (8.5)	237 (8.0)
EU and Other	2,403 (4.5)	198 (4.3)	10,422 (7.7)	389 (13.1)
Mother's unpaid care				
None	43,745 (81.9)	3,674 (79.7)	108,063 (80.1)	1,930 (64.9)
1-19 hours	4,392 (8.2)	352 (7.6)	16,121 (11.9)	414 (13.9)
20-49 hours	1,823 (3.4)	205 (4.4)	3,739 (2.8)	200 (6.7)
>50 hours	3,440 (6.4)	376 (8.2)	7,016 (5.2)	432 (14.5)
Mother's activity limitation				
Not limited	43,725 (81.9)	4,184 (90.8)	12,1073 (89.7)	2,682 (90.1)
A little	4,649 (8.7)	231 (5.0)	7,151 (5.3)	150 (5.0)
A lot	5,026 (9.4)	192 (4.2)	6,715 (5.0)	144 (4.8)
Area of residence				
Urban	15,948 (29.9)	1,496 (32.5)	18,739 (13.9)	429 (14.4)
Intermediate	30,576 (57.3)	2,092 (45.4)	72,619 (53.8)	1,120 (37.6)
Rural	6,876 (12.9)	1,019 (22.1)	43,581 (32.3)	1,427 (48.0)
Household tenure				
Owner	18,555 (34.7)	3,342 (72.5)	111,386 (82.5)	2,534 (85.1)
Private rent	16,859 (31.6)	402 (8.7)	15,145 (11.2)	286 (9.6)
Social rent	17,986 (33.7)	863 (18.7)	8,408 (6.2)	156 (5.2)
Number of cars				
2+ cars	4,414 (8.3)	2,323 (50.4)	91,461 (67.8)	2,325 (78.1)
1 car	27,842 (52.1)	1,481 (32.1)	37,793 (28.0)	539 (18.1)
No car	21,144 (39.6)	803 (17.4)	5,685 (4.2)	112 (3.8)
Resident father's education				
Tertiary			41,051 (30.4)	647 (23.4)
Secondary			73,076 (54.2)	1635 (59.1)
No qualification			20,264 (15.0)	484 (17.5)

Continued

Table 1: Continued

	Single-parent household		Two-parent household	
	Co-resident grandparent No. (%) households			
	No	Yes	No	Yes
Co-resident grandparent activity limitation				
No grandparent	53,400 (100)		134,939 (100)	
Not limited		2,652 (57.6)		1,395 (46.9)
A little		889 (19.3)		616 (20.7)
A lot		1,066 (23.1)		965 (32.4)
Co-resident grandparent's age group				
No grandparent	53,400 (100)		134,939 (100)	
Below 49		763 (16.6)		199 (4.3)
50-59		1,774(38.5)		580 (12.6)
60-69		1,320 (28.7)		819 (17.8)
70 and above		750 (16.3)		1,378 (29.9)
The presence of at least one child				
Aged 1 to 4 years	18,335 (34.3)	2,072 (45.0)	50,575 (37.5)	1,202 (40.4)
Aged 5 to 11 years	27,208 (51.0)	1,888 (41.0)	70,533 (52.3)	1,435 (48.2)
Aged 12 to 16 years	23,271 (43.6)	1,144 (24.8)	59,594 (44.2)	1,235 (41.5)

mothers. Co-resident grandparents living with single mothers are younger, 55.1% are aged below 59 years of age vs. 16.9% living in a two-parent household.

More preschool children live with a co-resident grandparent in a single-mother household than without (45% vs. 34.4%), but this reverses for children older than 5 years of age and remains true for two-parent households but with a smaller gap.

Table 2 presents the marginal effects results for mothers in single-parent households (first two columns) and in two-parent households (last two columns). The presence of a co-resident grandparent was used as a proxy for informal childcare provision and the association between co-resident grandparent and mother's employment status is presented in columns (1) and (3) while columns (2) and (4) account for the co-resident grandparent's health.

All things considered, the presence of co-resident grandparents was associated with an increased probability that a mother was employed; this effect was more pronounced for single mothers (3.7 percentage points) but still significant for those living in two-parent households (2 percentage points). However, this relationship was modified by the health (activity limitation) of the grandparent. For single mothers, labour force participation increased by 6.5 and 6 percentage points if the co-resident grandparent reported a lot or a little activity limitation, respectively; but only by 1.6 percentage points if the grandparent had no activity limitation compared with having no co-resident grandparent. Similar results were found for mothers living in two-parent households with co-resident grandparents with no limitation having no significant impact. This seemingly counterintuitive finding might be explained if co-resident grandparents with no activity limitation were still in paid employment and may not be engaged in informal childcare. The effect of having one co-resident grandparent in employment differs between single-parent and two-parent households. While for single mothers, labour force participation increases by 2.7 percentage points, there is no significant effect on the labour force participation of mothers living in two-parent households.[6]

The relationship between demographic and socio-economic characteristics and labour market participation was generally as expected, with the mother's probability of participation increased with their level of educational attainment, and reduced with increasing hours of unpaid care provided, or with increasingly severe activity limitation. Mothers' unpaid care hours could be for any family member or outside the household. The fact mothers with a co-resident grandparent were engaged in significant levels of caregiving (Table 1) may be because the grandparent lives with their children due to bad health. We address this question by running an OLS model with mothers with unpaid care vs. no unpaid care hours as the outcome variable. The results presented in Appendix Table 2 suggest the presence of grandparents with ill health in the household compared with not having a co-resident grandparent is positively associated with the unpaid hours of care provided by the mother in both single and two-parent households suggesting to some extent why grandparents co-resid in the household. Mother's age was associated with a reduced probability of working as approaching retirement age. The higher probability of employment within the protestant community is keeping in line with the theory [42], and historical patterns of employment for Protestants and Catholics in Northern Ireland [39]. Women in poorer households, as measured by housing tenure and car availability, had a lower probability of engaging with the labour market compared with more affluent peers. Having children aged 1 to 4 reduces by 12.5 percentage points the likelihood of paid employment for single mothers compared with those without children of that age. Similar negative associations with mother's employment were found for the presence of children aged 5 to 11 and 12 to 16 years of age but at a decreasing magnitude as

[6]Appendix Table 1 in the Appendix presents the full results of the model adjusting for grandparent employment status.

Table 2: Mothers in paid employment: co-resident grandparent and health status

Dependent variable: mother in employment vs. not employment	Single-parent household		Two-parent household	
	Grandparent's health		Grandparent's health	
Mothers age group				
20–29				
30–39	0.079***(0.005)	0.078*** (0.005)	0.018*** (0.004)	0.018*** (0.004)
40–49	0.069***(0.006)	0.068*** (0.006)	0.003 (0.004)	0.003 (0.004)
50–59	0.013 (0.010)	0.011 (0.010)	−0.054*** (0.006)	−0.054*** (0.006)
Mother's education				
Tertiary				
Secondary	−0.110***(0.005)	−0.110*** (0.005)	−0.108*** (0.002)	−0.108*** (0.002)
No qualification	−0.306*** (0.006)	−0.306*** (0.006)	−0.299*** (0.005)	−0.299*** (0.005)
Mother's country of birth				
NI				
GB and ROI	−0.038***(0.007)	−0.038*** (0.007)	−0.047*** (0.004)	−0.047*** (0.004)
EU and Other	0.109***(0.008)	0.110*** (0.008)	−0.029*** (0.004)	−0.029*** (0.004)
Mother's religion				
Catholic				
Protestant	0.035***(0.004)	0.035*** (0.004)	0.021*** (0.002)	0.021*** (0.002)
No reg Other	−0.040***(0.005)	−0.040*** (0.005)	−0.022*** (0.004)	−0.022*** (0.004)
Mother's unpaid care				
None				
1-19 hours	0.020***(0.006)	0.018*** (0.007)	0.020*** (0.003)	0.019*** (0.003)
20-49 hours	−0.163***(0.009)	−0.165*** (0.009)	−0.091*** (0.007)	−0.091*** (0.007)
>50 hours	−0.194***(0.007)	−0.196*** (0.007)	−0.190*** (0.005)	−0.191*** (0.005)
Area of residence				
Urban				
Intermediate	−0.012***(0.004)	−0.012*** (0.004)	−0.005* (0.003)	−0.005* (0.003)
Rural	−0.066***(0.006)	−0.065*** (0.006)	−0.048*** (0.003)	−0.048*** (0.003)
Number of cars				
2+ cars				
1 car	0.022***(0.006)	0.020*** (0.007)	−0.057*** (0.003)	−0.057*** (0.003)
No car	−0.118*** (0.007)	−0.120*** (0.007)	−0.135*** (0.006)	−0.135*** (0.006)
Household tenure				
Owner				
Private rent	−0.201*** (0.005)	−0.202*** (0.005)	−0.114*** (0.004)	−0.115*** (0.004)
Social rent	−0.179*** (0.005)	−0.180*** (0.005)	−0.141*** (0.005)	−0.141*** (0.005)
Mother's activity limitation				
Not limited				
A little	−0.246*** (0.006)	−0.247*** (0.006)	−0.203*** (0.005)	−0.203*** (0.005)
A lot	−0.419*** (0.006)	−0.420*** (0.006)	−0.492*** (0.006)	−0.492*** (0.006)
Presence of children				
No children of that specific age				
Aged 1 to 4 years	−0.125*** (0.004)	−0.125*** (0.004)	−0.099**** (0.003)	−0.099*** (0.003)
Aged 5 to 11 years	−0.079*** (0.004)	−0.079*** (0.004)	−0.077*** (0.002)	−0.077*** (0.002)
Aged 12 to 16 years	−0.046*** (0.005)	−0.046*** (0.005)	−0.047*** (0.003)	−0.047*** (0.003)
Resident father's education				
Tertiary				
Secondary			0.022*** (0.003)	0.022*** (0.003)
No qualification			−0.020*** (0.004)	−0.020*** (0.004)
Co-resident grandparent	0.037*** (0.007)		0.019*** (0.007)	

Continued

Table 2: Continued

Dependent variable: mother in employment vs. not employment	Single-parent household	Two-parent household
	Grandparent's health	Grandparent's health
Co-resident grandparent activity limitation		
No grandparent		
A lot	0.065*** (0.013)	0.021* (0.011)
A little	0.059*** (0.014)	0.028* (0.015)
No limitation	0.016* (0.009)	0.011 (0.010)
N	58,007	137,915

Notes: ***p<0.01, **p<0.05, *p<0.1. Marginal effects. Robust standard errors in parenthesis.

the children's age increased for both single-parent and two-parent households. Overall, mothers with children of preschool age had lower participation, with a low probability of 10 percentage points to be in employment for mothers in two-parent households.

Father's lack of qualification was associated with a negative significant effect on mother's employment suggesting all things equal, lower earnings or less affluent two-parent households have lower levels of maternal employment. The father's secondary level of education was associated with a rise in the mother's employment even compared with the baseline group (father's tertiary level of education).

We also ran a separate model controlling for the gender of the co-resident grandparents. We found that co-resident grandmothers even in poor health have a positive impact on the mothers' employment in single and two-parent households compared with not having a co-resident grandmother (Table 3). The presence of a co-resident grandfather has no impact on the mother's employment living in two-parent households but a significant positive effect on the single mother's employment, although the grandfather reports poor health. Co-resident grandparents in good health have no significant effect on mothers' employment compared with not having a co-resident grandparent. It can be the case these co-resident grandparents are in paid employment, and we discussed these results above with the full results presented in Appendix Table 1. This effect could be due to grandparents in single-parent households being in better health, younger and still active in the labour market.

Table 4 shows that the marginal effect of co-resident grandparents on the mother's employment varies with the child's age. Each column presents the mother's probability of being in paid employment (full or part-time). The results were derived from six separate regression models adjusted for all maternal and household factors in Table 1; the first column reports the results for single mothers' households with children of preschool age (1-4 years), the second for primary school-age children (5-11 years), and the third for secondary school stages (12-16 years). In each case, the presence of a grandparent was associated with an increased probability the mother was in employment. Nonetheless, the effects were larger for households with children of primary school age and lowest in households with pre-school age children. Indeed, for mothers in a two-parent household with children of pre-school age, having a co-resident grandparent had a negative though not significant impact on her employment. The presence of a grandparent was less important in households with children of secondary school age. These households would include older women, perhaps closer to retirement and consequently with older co-resident grandparents as well as possible longer periods of economic inactivity while the children were of pre-school and/or primary school age.

Additional analysis investigates the effect of the interaction between the presence of grandparents and the presence of children of preschool age (1-4 years); primary-school age (5-11 years); and secondary school stages (12-16 years) only, on mothers' paid employment. Marginal effects are graphically presented in the Appendix, Appendix Table 4, and show that co-resident grandparents have a positive impact on mothers' paid employment. Each model reports the results relative to having no co-resident grandparents and no children up to 16 years of age in the household. For mothers in single and two-parent households, the presence of a grandparent is associated with a positive effect on their paid employment regardless of the age of their child.

The final stage of our analysis observes the effect of co-resident grandparents on the mother's weekly hours in paid employment, full and part-time work versus not in paid employment. The table below (Table 5) presents the predicted probabilities results based on a multinomial logit model. The presence of a grandparent in the household increases the mother's participation in full-time employment by 2.7 percentage points for a single mother and by 3.7 percentage points for a mother in a two-parent household. Furthermore, co-resident grandparents regardless of his or her reported health have a positive effect on the mother's full-time employment, but no effect if the co-resident grandparent is employed. We find co-resident grandparents have no statistically significant impact on single mothers' part-time employment but a negative significant effect of 1.7 percentage points in partnered mothers' part-time employment. Remarkably, co-resident grandparents reporting poor health have a positive impact on single mothers' part-time employment of up to 3.5 percentage points and a negative impact of 3.7 percentage points on partnered mother's part-time employment. Nonetheless, co-resident grandparents reporting no health limitation have no significant impact on the mother's part-time employment and this is true for employed grandparents as well. Additionally, co-resident grandparents 50 years of age and above have a positive

Table 3: Mothers in paid employment: presence of co-resident grandparent by gender

Dependent variable: mother in employment vs. not employment Grandmothers' health	Single-parent household	Two-parent household	Grandfathers' health	Single-parent household	Two-parent household
A lot	0.061*** (0.013)	0.002 (0.013)	A lot	0.051*** (0.016)	0.026 (0.017)
A little	0.070*** (0.017)	0.036** (0.017)	A little	0.031 (0.022)	0.031 (0.021)
Not limited	0.009 (0.009)	0.015 (0.012)	Not limited	−0.002 (0.011)	−0.008 (0.013)
N	58,007	137,915		58,007	137,915

Notes: All other variables as shown in Table 2 are included, coefficients not reported but available on request. ***p<0.01, **p<0.05, *p<0.1. Marginal effects. Robust standard errors in parenthesis.

Table 4: Mothers in paid employment: co-resident grandparent and children's age

Dependent variable: mother in employment vs. not employment	Age of children in the household, only					
	Aged 1 to 4	Aged 5 to 11	Aged 12 to 16	Aged 1 to 4	Aged 5 to 11	Aged 12 to 16
	Single parent household			Two parent household		
	(1)	(2)	(3)	(4)	(5)	(6)
Co-resident grandparent	0.022 (0.016)	0.053*** (0.014)	0.011 (0.017)	−0.018 (0.015)	0.032** (0.015)	0.018 (0.014)
N	11,231	14,155	14,213	25,277	25,131	32,705

Notes: All other variables as shown in Table 2 are included, coefficients not reported but available on request. ***p<0.01, **p<0.05, *p<0.1. Marginal effects. Robust standard errors in parenthesis.

significant effect on single mothers' employment of up to 6.2 percentage points (60 to 69 years of age) while co-resident grandparents below 49 years of age have a negative impact of 2.6 percentage points. The results suggest that only co-resident grandparents aged 50 to 59 and above 70 years of age have a positive impact on partnered mothers' employment (Appendix Table 3).

In general, observing the results in the first panel of Table 5, co-resident grandparents have a significant negative impact on mothers' unemployed status (not employed), suggesting, as we have seen a significant positive impact on mothers' employment. Co-resident grandparents have a negative impact of 4 percentage points on single mothers' not employed status and 2 percentage points on partnered mothers', respectively.

Discussions

The true economic contribution of grandparents providing cost-free childcare is likely to be much larger than recorded here, mainly because the Census only enables us to observe co-resident grandparents at one moment in time. We cannot, therefore, measure the much more frequent occurrence where grandparents live close enough to their daughters or sons to be able to contribute substantially to childcaring and the effects that this is having on the employment of mothers. However, this trend of increasing provision by older generations may be offset by changes to the state pension age (SPA) experienced in the UK and other Western countries. These policies have already dramatically increased the pension age from 60 to 66 for women with future advances in line with changes in life expectancy (Pensions Act, 2011; 2014). This will, as highlighted by [43] almost two decades ago, make it more difficult for grandparents to become free enough and potentially offer little informal childcare to the next generations of mothers allowing re-engage in the labour market. The unintended consequence of changes to the SPA in Italy, along with the deleterious effects of marriage dissolution between grandparents, is discussed by Zamberletti et al. (2018) and also by Posadas and Vidal-Fernandez (2013), who have suggested that policies that raise retirement ages might increase older cohorts' labour participation rates at the expense of young women through childcare availability.

However, from an intergenerational perspective at the family level, supporting both young children and dependent grandparents, the so-called Sandwich Generation [44, 45], can be an added burden on families [46] and studies suggest that although both women and men can be affected, the emotional and physical burdens are acknowledged to fall more heavily on women who traditionally provide a greater proportion of the caring and practical support and assistance [46]. In such cases, the addition of caring for grandparents would prove a further impediment to maternal employment rates.

Interestingly, [47], using SHARE data, claimed that the additional activity and or sense of purpose associated with child care had a positive effect on grandmother's health, though not on the health of grandfathers. [48] using the British Household Panel Survey and the UK Household Longitudinal Study, have demonstrated intergenerational effects whereby the social class of grandparents can influence the grandchild's chances and aspirations as a young adult and into adulthood.

Mothers generally weigh the attributes of paid employment and time spent at home differently than women and most fathers and are more involved in childcare and family duties compare with men. Childbirth often leads to career interruptions for women as they take maternity leave or reduce their work hours to fulfil caregiving responsibilities

Table 5: Multinomial logit model: Mothers in paid employment: type of mother's employment

Mother's working hours: Not employed (base)						
	Single parent household			**Two parent household**		
Co-resident grandparent: Yes	−0.040*** (0.007)			−0.020*** (0.0007)		
Grandparent's health						
No grandparent						
A lot		−0.068*** (0.013)			−0.022** (0.011)	
A little		−0.065*** (0.015)			−0.026* (0.015)	
Not limited		−0.017* (0.009)			−0.016 (0.01)	
Co-resident grandparent: employed			−0.031** (0.015)			−0.019 (0.019)
Mother's working hours: Full-time (base)						
	Single parent household			**Two parent household**		
Co-resident grandparent: Yes	0.027*** (0.006)			0.037*** (0.009)		
Grandparent's health						
No grandparent						
A lot		0.033*** (0.012)			0.060*** (0.016)	
A little		0.034*** (0.012)			0.031* (0.019)	
Not limited		0.022** (0.007)			0.025* (0.013)	
Co-resident grandparent: employed			0.003 (0.015)			0.001 (0.022)
Mother's working hours: Part-time (base)						
	Single parent household			**Two parent household**		
Co-resident grandparent: Yes	0.012 (0.008)			−0.017* (0.009)		
Grandparent's health						
No grandparent						
A lot		0.035** (0.015)			−0.037** (0.016)	
A little		0.031** (0.016)			−0.005 (0.019)	
Not limited		−0.005 (0.01)			−0.009 (0.014)	
Co-resident grandparent: employed			0.027 (0.017)			0.019 (0.023)
N	58,007	58,007	4,607	137,915	137,915	2,976

Notes: All other variables as shown in Table 2 are included but coefficients not reported. ***p<0.01, **p<0.05, *p<0.1. Marginal effects. Robust standard errors in parenthesis.

[49]. The length of career interruption hinders women's ability to maintain continuous employment and affects career progression. The literature suggests that after childbirth women are more likely to return to lower-paying, part-time, or flexible jobs compared to men [50] contributing to occupational segregation, wherein women are overrepresented in certain industries or roles that offer limited opportunities for career advancement and higher wages. After childbirth, a mother's preference to stay home might be related to a more comfortable financial situation and the cost is her forgone wage. The return to paid employment increases the willingness to access childcare and brings about the childcare cost that the mother must pay. The childcare cost could therefore be associated with the trade-off between staying home and returning to paid employment. In NI, the cost of a full-time childcare place in 2021 is consuming on average 34% of the median household income before housing costs; with the average cost of a full-time childcare place at *e*170 per week, according to the annual childcare cost survey conducted by, a charitable group that carried its first survey of its kind in Northern Ireland in 2010.

In societies with growing uncertainty and increasing living cost, families, in particular mothers often have a trade-off to consider between childcare costs and returning to work. The cost of childcare on women labour market participation could be translated into the loss of earnings opportunities, of skills and work experience during interruptions. The provision of formal childcare services should be at least in theory one of the main solutions to tightening the gap in employment rates and alongside parental leave responsibilities. High childcare costs drive mothers away from employment and or bring grandparents into providing more hours of childcare that allow mothers back into paid work ([11, 13] and [12] among others).

The care responsibilities of women expand beyond the care of their children to widely unpaid care for people with whom a woman has a social relationship. A woman's main caregiving responsibility after children is to her elderly parents. [51] find that most of the parental caregivers are in full-time employment, with 81% under the age of sixty, suggesting working-age adult children are the most common carers for elderly parents. Our results suggest mothers are more likely to work even when the co-resident grandparents are in poor

health while co-resident grandparents in good health have no significant effect on mothers' employment compared with not having a co-resident grandparent. Although we cannot discuss a causal effect and not the main focus of our study, we argue our findings are not entirely in line with the literature. For example, [52] find that a 10% increase in informal caring to a parent reduces the probability of employment of adult children aged 50+ years. The authors also find an increase in caregiving of 10% has no significant effect on working hours, an insignificant effect by gender, and that male working hours suffered much more in Nordic countries than Southern European countries. [53] finds that providing care to a co-resident or non-coresident parent reduces labour market participation and [54] argue the impact of daily informal caregiving to an elderly parent on labour force participation is relatively insignificant in Nordic and Central European countries, and negative in Southern Europe. The results on this subject are mixed, when looking at the intensive margin of labour supply, findings are either negative or insignificant, while, in contrast, more of a consensus exists for the extensive margin of labour supply, with parental caregiving negatively affecting the probability of employment. Our findings suggest that co-resident grandparents in poor health have a positive effect on mothers' paid employment and are not the main focus of our paper but none less important and worth further analysis, not able to carry on the available dataset, to determine the direction and possible causal effect on the mother's labour market participation. We endeavour to seek further analysis on this topic.

Conclusions

To the best of our knowledge, this empirical paper is the first to use the entire census dataset to quantify the effect of informal childcare provided by co-resident grandparents on mothers' labour force participation. Using a cohort of 195,922 mothers with children aged 1 to 16 years of age, we argue that co-resident grandparents have a significant impact on maternal labour force participation in Northern Ireland. We observe the impact of a co-resident grandparent remained significant even after adjustment for a wide array of demographic, socio-economic and area-level factors known to be associated with labour force participation; the association held for mothers in a single-parent and two-parent household regardless of the age of the dependent children.

The presence of a co-resident grandparent was associated with an overall increase in the probability of employment by 3.7 percentage points for single-parent mothers and 2% for mothers in two-parent households. These results hold when we consider grandparental health, though co-resident grandparents with no activity limitation had little impact on maternal employment. In general, grandparents reporting no activity limitation are younger and in paid employment, potentially leaving less time for informal childcare. Mothers with co-resident grandparents report an increase of 2.7 percentage points for a single mother and of 3.7 percentage points for a mother in a two-parent household of being in full-time than mothers without. The presence of a co-resident grandparent was associated with an increase in employment by at least 3.2 percentage points among mothers with primary-school-age children. Using the UK Millennium Cohort Study, [55] found similar and significant causal effects of grandparents' childcare in raising the labour force participation for mothers with a child of school entry age on average by 12% and in general, raises the participation of mothers who use grandparent childcare by 33% compared to mothers that don't have access to this care. Posadas and Vidal-Fernandez (2013) using a US longitudinal survey, found that grandparental childcare has a significant positive effect (9% increase) on mothers' labour force participation, with a bigger impact on single or never-married mothers.

We found that being a co-resident grandmother is associated with a higher probability of a mother's labour force participation regardless of the grandmother declaring poor health, especially for single-parent households. Grandmothers tend to be more involved in grandchild care provision and in caring and helping activities with their grandchildren [34].

This paper explores Northern Irish maternal employment through the lens of cross-sectional administrative data. Our findings highlight the importance of co-resident and perhaps more so, non-co-resident grandparents on maternal employment, considering 55% of families in Northern Ireland use grandparents to provide part or all of their childcare in 2021 (Employers for Childcare, 2021). The current increasing interest across the rest of the UK in enhancing early learning programmes to facilitate working parents shows the vital importance of providing good quality and accessible childcare facilities.

Acknowledgements

'Administrative Data Research - Northern Ireland (ADR-NI) takes privacy protection very seriously. All information that directly identifies individuals/organisations will be removed from the datasets by trusted third parties before researchers access them. All researchers using ADR-NI are trained and accredited to use sensitive data safely and ethically, they will only access the data via a secure environment and all their findings will be vetted to ensure they comply with strict confidentiality requirements. The help provided by the staff of the Administrative Data Research Centre - Northern Ireland (ADRC-NI) and the ADR-NI support officers within NISRA Research Support Unit (RSU) is acknowledged. ADR-NI is funded by the Economic and Social Research Council (ESRC). The authors alone are responsible for the interpretation of the data and any views or opinions presented are solely those of the author and do not necessarily represent those of ADR-NI. The Census branch, NISRA data has been supplied for the sole purpose of this project.'

Conflict of interest statement

The Authors have no conflict of interest to declare.

Ethics statement

The research was conducted in the NISRA safe-setting environment and funded by Administrative Data Research - Northern Ireland (ADR-NI). The project was approved by

NISRA Research Support Unit (RSU). The Census data has been supplied for the sole purpose of this project.

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Appendix

Appendix Table 1: Mothers in paid employment: co-resident grandparent employment status

Dependent variable: mother in employment vs. not employment	Single-parent household	Two-parent household
Mothers age group		
20-29		
30-39	0.124*** (0.014)	0.019 (0.024)
40-49	0.105*** (0.021)	0.058** (0.028)
50-59	0.102** (0.051)	0.059 (0.037)
Mother's education		
Tertiary		
Secondary	−0.059*** (0.015)	−0.122*** (0.016)
No qualification	−0.259*** (0.024)	−0.315*** (0.033)
Mother's country of birth		
NI		
GB and ROI	−0.008 (0.03)	−0.036 (0.029)
EU and Other	0.157*** (0.023)	−0.040 (0.028)
Mother's religion		
Catholic		
Protestant	−0.003 (0.014)	0.004 (0.016)
No reg Other	−0.023 (0.019)	−0.003 (0.026)
Mother's unpaid care		
None		
1-19 hours	0.039* (0.022)	0.067*** (0.021)
20-49 hours	−0.054* (0.031)	−0.033 (0.032)
>50 hours	−0.159 ***(0.026)	−0.162*** (0.026)
Area of residence		
Urban		
Intermediate	−0.042*** (0.014)	−0.044** (0.022)
Rural	−0.074*** (0.018)	−0.070*** (0.023)
Number of cars		
2+ cars		
1 car	−0.053*** (0.015)	−0.046** (0.022)
No car	−0.109*** (0.022)	−0.020 (0.046)
Household tenure		
Owner		
Private rent	−0.287*** (0.081)	0.106 (0.117)
Social rent	−0.362*** (0.061)	−0.143 (0.135)
Mother's activity limitation		
Not limited		
A little	−0.204*** (0.032)	−0.221*** (0.041)
A lot	−0.441*** (0.033)	−0.497*** (0.041)
Presence of children		
Aged 1 to 4	−0.051*** (0.014)	−0.094*** (0.019)
Aged 5 to 11	0.015 (0.014)	−0.040** (0.016)
Aged 12 to 16	−0.028*** (0.016)	−0.047** (0.02)
Father's education		
Tertiary		
Secondary		0.038* (0.020)
No qualification		0.020 (0.027)
Co-resident grandparent employed	0.027* (0.015)	0.020 (0.019)
N	**4,607**	**2,976**

Appendix Table 2: Mother's with unpaid care vs. no unpaid care: co-resident grandparent health status

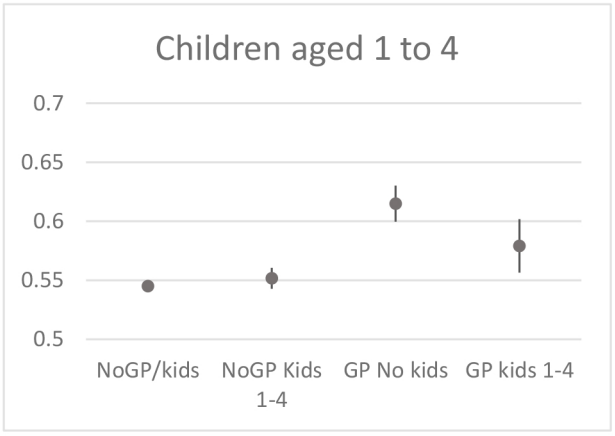
Dependent variable: mother's unpaid care hours vs no unpaid care	**Single-parent household**	**Two-parent household**
Mother's age group		
20-29		
30-39	0.069*** (0.004)	0.049*** (0.004)
40-49	0.112*** (0.005)	0.141*** (0.004)
50-59	0.121*** (0.008)	0.211*** (0.005)
Moher's education		
Tertiary		
Secondary	−0.020*** (0.005)	0.003 (0.002)
No Qualifications	−0.046*** (0.006)	−0.028*** (0.004)
Mother's country of birth		
NI		
GB and ROI	−0.010 (0.006)	−0.036*** (0.004)
EU and Other	−0.044*** (0.008)	−0.088*** (0.004)
Mother's religion		
Catholic		
Protestant	0.006* (0.003)	0.004** (0.002)
No religion and Other	−0.009** (0.005)	−0.003 (0.004)
Area of residence		
Urban		
Intermediate	−0.018*** (0.004)	−0.011*** (0.003)
Rural	−0.031*** (0.005)	−0.009** (0.004)
Number of cars		
2 cars		
1 car	−0.011** (0.006)	0.006** (0.003)
No car	−0.059*** (0.006)	−0.004 (0.006)
Household tenure		
Owner		
Private Rent	−0.009** (0.004)	0 (0.004)
Social Rent	0.026*** (0.004)	0.062*** (0.005)
Mother's activity limitation		
Not limited		
A little	0.012** (0.006)	0.043*** (0.005)
A lot	−0.072*** (0.006)	−0.092*** (0.005)
Co-resident grandparent activity limitation		
No grandparent		
A lot	0.321*** (0.012)	0.446*** (0.013)
A little	0.081*** (0.013)	0.171*** (0.016)
No limitation	−0.081*** (0.008)	−0.042*** (0.011)
Mother employed	−0.079*** (0.004)	−0.061*** (0.003)
N	**58,007**	**137,915**

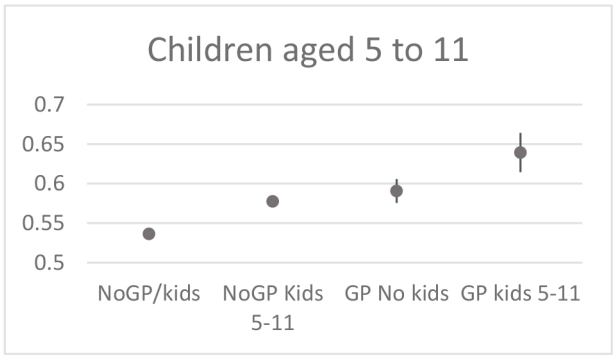
Appendix Table 3: Mothers in paid employment: co-resident grandparent age

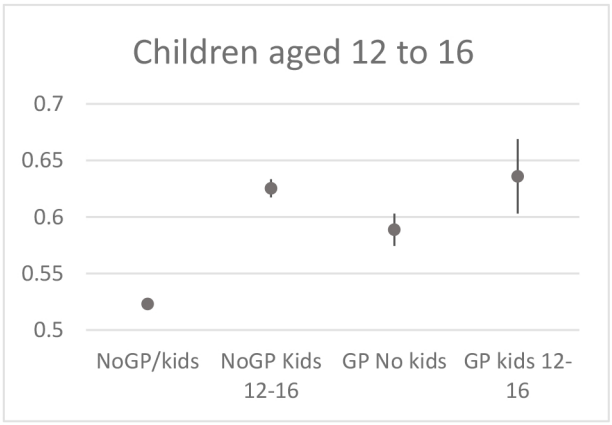
Dependent variable: mother in employment vs. not employment	Single-parent household	Two-parent household
Mothers age group		
20-29		
30-39	0.076*** (0.005)	0.018*** (0.004)
40-49	0.066*** (0.006)	0.003 (0.004)
50-59	0.009 (0.010)	−0.054*** (0.006)
Mother's education		
Tertiary		
Secondary	−0.110*** (0.005)	−0.108*** (0.002)
No qualification	−0.306*** (0.006)	−0.299***(0.005)
Mother's country of birth		
NI		
GB and ROI	−0.038*** (0.007)	−0.047*** (0.004)
EU and Other	0.110*** (0.008)	−0.029*** (0.004)
Mother's religion		
Catholic		
Protestant	0.035*** (0.004)	0.021*** (0.002)
No reg Other	−0.040*** (0.005)	−0.022*** (0.004)
Mother's unpaid care		
None		
1-19 hours	0.019*** (0.006)	0.020*** (0.003)
20-49 hours	−0.163*** (0.009)	−0.091*** (0.007)
>50 hours	−0.194*** (0.007)	−0.191*** (0.005)
Area of residence		
Urban		
Intermediate	−0.012*** (0.004)	−0.005* (0.003)
Rural	−0.066*** (0.006)	−0.048*** (0.003)
Number of cars		
2+ cars		
1 car	0.022*** (0.006)	−0.057*** (0.003)
No car	−0.118*** (0.007)	−0.135*** (0.006)
Household tenure		
Owner		
Private rent	−0.201*** (0.005)	−0.115*** (0.004)
Social rent	−0.179*** (0.005)	−0.141*** (0.005)
Mother's activity limitation		
Not limited		
A little	−0.246*** (0.006)	−0.203*** (0.005)
A lot	−0.419*** (0.006)	−0.492*** (0.006)
Presence of children		
Aged 1 to 4	−0.124*** (0.004)	−0.099*** (0.003)
Aged 5 to 11	−0.079*** (0.004)	−0.077*** (0.002)
Aged 12 to 16	−0.044*** (0.005)	−0.047*** (0.003)
Father's education		
Tertiary		
Secondary		0.022*** (0.003)
No qualification		−0.020*** (0.004)
Grandparent's age group		
No grandparent		
Below 49	−0.026* (0.015)	−0.007 (0.033)
50-59	0.041*** (0.011)	0.054*** (0.015)
60-69	0.062*** (0.012)	−0.017 (0.014)
70 and above	0.054*** (0.016)	0.027*** (0.009)
N	58,007	137,915

Appendix Table 4: Mother in paid employment: co-resident grandparent interaction with children's age

Single parent households







Two parent households