

## RESEARCH ARTICLE

# Informal care and financial stress: Longitudinal evidence from Australia

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Email: [i.koomson@uq.edu.au](mailto:i.koomson@uq.edu.au);[koomsonisaac@gmail.com](mailto:koomsonisaac@gmail.com)**Abstract**

The number of people providing informal care has increased considerably in the last years while, at the same time, about one in four Australians have financial stress problems. This study uses rich longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA) survey to estimate the effect of informal care on financial stress. To establish causality, we exploit a fixed effect-instrumental variable approach to address omitted variable bias and reverse causality problems. Our findings show that informal caregiving increases financial stress between 9.9 and 14.5 percentage points. This finding is robust across a battery of quasi-experimental methods. The effect of informal caregiving on financial stress is more pronounced among males, rural residents and those living in low socioeconomic areas. Our analyses further show that financial fragility and social isolation are important channels through which informal caregiving affects financial stress.

**KEYWORDS**

Australia, financial resilience, financial stress, informal care

## 1 | INTRODUCTION

Globally, informal care is by far the most common form of long-term care and is referred to as a form of unpaid ongoing care provision by family, friends, or relatives to people with chronic illness or disability (Roth et al., 2015; C. Van Houtven et al., 2019). Forecasts based on the *Global Burden of Disease* studies predict an increasing demand for long-term care in the next decades and governments are grappling with identifying solutions for the mounting pressure on long-term care systems (Feigin et al., 2016; Iburg et al., 2023). Informal care has many benefits compared to other forms of long-term care, including improved wellbeing of the person who is being cared for, reduced health care use, and allowing the care recipient to remain at home (C. H. Van Houtven & Norton, 2008). Above all, it is considered a 'cheaper' alternative to other forms of long-term care, such as

formal care provided by paid helpers in the person's home or institutionalised care (i.e., entry into nursing homes). Although informal care is not a traditional market good, and despite its benefits, a growing body of literature is focussing on the costs associated with informal care provision, showing its negative impacts on labour market participation (Bolin et al., 2008; Heitmueller, 2007; Leigh, 2010), caregivers' wages (C. H. Van Houtven et al., 2013) as well as their savings (Sakata et al., 2022).

Beyond these direct costs, informal caregiving has attracted the interest of researchers who have empirically examined its linkages and found that providing informal care has a deteriorating impact on physical and mental health, including self-assessed health, pain, depression and mental health (Bom et al., 2019; Schmitz & Westphal, 2015), it increases food insecurity (Korgaonkar et al., 2022), and reduces overall wellbeing (Van den Berg et al., 2014). The impact of

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informal care on health and financial stress has been found to vary depending on the specific population groups who are being cared for. For example, a study of informal carers in Italy found that women with caring duties for both children and parents have a higher probability of being depressed (Brenna, 2021). Another study in Australia found that caring for a person with a mental illness was associated with increased odds of experiencing financial stress, whereas caring for a person with cancer or dementia was associated with decreased odds (DiGiacomo et al., 2020).

Despite the many studies, which some anecdotally extend discussions to cover its financial burden on caregivers, researchers are yet to engage in an empirical analysis of how informal caregiving is associated with financial stress in general and in its varied forms. In the context of Australia and many advanced countries, informal carers are provided with some financial support to help avert any financial loss due to reduced working time while providing care. For example, the Australian Government provides income support payment for informal caregivers through the means-tested Carer Payment as well as the Carer Allowance. The Care payment provides income support to around 10% of carers, but this allowance is a once off payment and smaller in size. Considering that informal caregiving and financial stress are increasingly becoming public health concerns in Australia, it is imperative to examine the link between informal caregiving and financial stress. This study uses longitudinal data to estimate the causal effect of informal caregiving on financial stress. We base our definition of financial stress on previous literature and create four sub-categories namely, 'financial difficulty', 'cashflow', 'hardship', and 'any stress' (Breunig & Cobb-Clark, 2005; Koomson et al., 2022). These variables are based on a battery of questions in the HILDA survey, including whether respondents have difficulty paying for necessities, such as electricity, rent and bills, if they were unable to heat the home and had to asked friends or family for financial help. In general, a respondent is classified as being financially stressed if two of the seven situations apply to them. Detailed conceptualisations of the four indicators are provided in the data section.

Our study makes three contributions to the literature. First, we explore the effect of informal care on financial stress, which is an important economic outcome, yet received little attention in the literature. While previous studies have examined the effect of informal care on labour market outcomes (Heitmueller, 2007; Leigh, 2010; Simard-Duplain, 2022), little attention has been given to its effect on financial stress. However, financial stress is a very important economic variable because of its intricate linkages with mental health and other health outcomes. For example, in England, it is estimated that 46% of people who have debt problems also have mental health issues (Money and Mental Health Policy Institute, 2019). Therefore, a better understanding of the effect of informal care on financial stress can provide pathways through which public policies can be designed to improve overall mental health.

Second, we investigate the effect of informal care on financial stress in the Australian context where the current levels of informal

care and mental health are public health issues. In 2020, it was estimated that there are 2.8 million informal carers and 900,000 primary carers who spend an average of 35 h a week providing care in Australia (Deloitte Access Economics, 2020). This represents more than every 1 in 10 people in Australia who provide some form of informal care and an increase of almost 6% since 2018. Furthermore, the cost of informal care was estimated to be 51 billion Australian dollars and the opportunity cost for productivity were estimated to be an additional \$15 billion (Deloitte Access Economics, 2020). Australia is one of the few developed countries that does not have any long-term care insurance and a recent inquiry into the aged care quality and safety revealed that the formal aged care system fails to meet the needs of its older, vulnerable, citizens (Commonwealth of Australia, 2021). Informal care is thus an important backbone of the long-term care system in Australia, making it imperative to study its effect on financial stress. In addition to a rise in the number of people providing informal care, Australians are under increasing financial stress, with one in four people reporting of finding it difficult to get by on their income (Biddle & Gray, 2022). Women and those in the lowest income bracket are most likely to experience financial stress (Koomson et al., 2022). Therefore, evidence on the effect of informal care on financial stress among the Australian populace can help policy makers to design appropriate policies to mitigate the adverse effects of informal care.

Finally, we utilise rich longitudinal population-based data spanning from 2005 to 2021, backed by rigorous analytical strategy that addresses endogeneity resulting from omitted variable bias and reverse causality to establish the causal effect of informal care on financial stress.

The remainder of the paper is organised as follows. Section 2 provides the theoretical foundations to our research questions, followed by the Data Section. Section 4 discusses our empirical strategy and Section 5 provides the results. Section 6 discusses our key findings and concluding remarks.

## 2 | BACKGROUND

Financial and economic stressors can vary substantially between caregivers, but some examples are income or salary, debt, savings, cashflow and (housing) wealth (C. H. Van Houtven, 2015). While people who decide to provide care may be systematically different from non-carers, they may already be financially vulnerable due to differences in human capital, including education, health and health behaviours (e.g., diet and exercise) (Carmichael et al., 2010; Heitmueller, 2007). Hence, comparing two people with similar human capital and economic status, if one decides to provide informal care and the other does not, that could still impact their financial situation very differently (Leigh, 2010; Sakata et al., 2022; C. H. Van Houtven et al., 2013). There are several reasons why providing informal care may impact the caregiver's financial situation and create financial stress; some of which have been outlined below.

## 2.1 | Caregiving and labour market outcomes

Research on the economic and financial aspects of informal caregiving have focused primarily on labour market outcomes, since it is the most obvious use of time to generate income and it is easy to quantify (Heitmueller, 2007; Leigh, 2010; Simard-Duplain, 2022). For example, people who choose to provide care may reduce their working hours or even change jobs, leading to a reduction in income and thus increasing financial stress, which the non-caregiver won't have to face (Simard-Duplain, 2022). Indeed, studies have shown that informal care negatively impacts work, the decision to retire as well as wages (C. H. Van Houtven et al., 2013). However, there may be many other subtle financial impacts on the labour force due to caregiving, such as reduced productivity of caregivers and thus a reduced likelihood of promotion and salary growth (C. H. Van Houtven, 2015). Carers/medical leave may be necessary and may result in periods of no pay despite remaining in the labour force. If an individual provides care for an elderly parent nearby, that person may be less likely to apply for a higher paying job if this requires relocation.

## 2.2 | Caregiving and financial fragility

Next to the direct costs related to labour market outcomes, caregiving may impact the caregiver's own health, resulting in higher downstream medical costs due to negative health consequences (C. H. Van Houtven & Norton, 2008). Caregivers may also incur much larger private costs, due to, for example, grocery bills, more heating and cleaning, transportation cost and hospital parking charges as well as costs related to medical supplies. For those who have a financial buffer, these costs may be manageable, but especially for those who are on lower incomes, even small, unexpected expenses can lead to financial fragility. Financial fragility reflects a lack of resources to cope with a potential, unexpected expense and can lead to financial stress when some combinations of the above-described costs arise simultaneously.

## 2.3 | Caregiving and social isolation

Informal caregiving has also been found to reduce caregiver well-being and can lead to depression and other adverse health outcomes (Bom et al., 2019; Van den Berg et al., 2014). Reduced wellbeing and mental illness may result in caregiver's social isolation and loneliness. A survey in the United Kingdom found that more than half of all caregivers reported that they had lost touch with friends or family due to caregiving (Carers UK, 2015). Social isolation can lead to financial stress if the caregiver lacks social support to manage financials or ask for help in difficult financial situations. In addition, social isolation may increase the risk of being subject to fraud, due to fewer opportunities to discuss finances with others.

In this paper, we study two mediators specifically, financial fragility and social isolation. As much research exists studying the

impact of caregiving on labour market outcomes (see Heitmueller, 2007; Leigh, 2010; Simard-Duplain, 2022), focussing on the latter will contribute to our understanding of how informal caregiving may lead to increased financial stress.

## 3 | DATA AND DESCRIPTION OF KEY VARIABLES

### 3.1 | Data

Data for this study are sourced from 17 waves of the HILDA surveys. HILDA is a household-based longitudinal data that is nationally representative and commenced in 2001 (Watson & Wooden, 2012). The HILDA survey uses in-person interviews and self-administered questionnaires to gather household- and individual-level information from the same respondents over time. Applying a multi-stage sampling strategy, data collection for each wave usually starts in July of the year and ends in March of the following year. The population includes all household members aged 15 years and above. Information from HILDA participants are collected using household- and individual-level questionnaires designed to track same respondents over time. Apart from sociodemographic variables, HILDA contains information on informal caregiving, health, personal and household finances, consumption and many more (Watson & Wooden, 2012). Although HILDA has 21 annual waves, our sample starts from 2005 to 2021 because HILDA began collecting information on informal care from wave 5. The unit of analysis in this study is individuals aged 15 years and above which resulted in an extracted sample of 244,622 person-period observations for 31,313 individuals. Our study focused on only individuals aged 15 years and above as it is consistent with the legal working age in Australia and applied by the Australian Bureau of Statistics (ABS) and the Australian Institute of Health and Welfare (AIHW) (Australian Institute of Health and Welfare, 2023a).

### 3.2 | Description of variables

#### 3.2.1 | Informal caregiving

In this study, we consider an informal caregiver to be a person who offers unpaid daily support to a resident or non-resident relative. We measure a respondent's extent of informal care provision by using the HILDA question that captures one's total weekly hours spent "caring for a disabled spouse or disabled adult relative or caring for elderly parents or parent-in-law" who is either a resident or non-resident of the household. That is, hours of informal care provided is used as our main exposure variable in the empirical analyses because it captures the intensive margin of informal caregiving. Previous studies have used a similar approach (Van den Berg et al., 2014; Zhu & Onur, 2023). As a robustness check, we also capture the extensive margin of informal caregiving by using a binary indicator of informal care. This identifies an informal caregiver as any

individual who (1) “actively cares for a household member due to long-term health condition, elderly, disability”; or (2) “actively cares for non-residents due to long-term health condition, elderly, disability”. A “Yes” response to either of the two questions is coded 1 to depict an informal caregiver while a double “No” response to both questions is coded as 0. Using the hours of care provided variable, all identified caregivers who reported zero hours of care were recoded as zero to ensure they at least performed a service.

### 3.2.2 | Financial stress

Following existing studies, four binary measures of financial stress are obtained from seven questions/indicators in the personal and household finance module in the HILDA survey. Using a 12-month recall period, each respondent was asked if he/she (1) “could not pay electricity, gas or telephone bills on time”; (2) “could not pay the mortgage or rent on time”; (3) “pawned or sold something”; (4) “went without meals”; (5) “was unable to heat home”; (6) “asked for financial help from friends or family”; and (7) “asked for help from welfare/community organisations”.

Our first measure, *financial difficulty*, is based on the approach in previous studies which considers financially stressed individuals as those who experience at least two or more of the seven indicators using a binary variable (Koomson et al., 2022; Wilkins et al., 2015). Our second and third measures (*cashflow* and *hardship*) are obtained by grouping indicators that connote cashflow problems and financial hardship respectively. Cashflow is measured as a binary variable to indicate an individual's affirmative response to at least one of the cashflow problems (indicators 1, 2, 6) (Breunig & Cobb-Clark, 2005; Breunig et al., 2019). Similarly, a “Yes” answer to any of sub-indicators 3, 4, 5 and 7 is coded as 1 to identify those in financial hardship (Breunig & Cobb-Clark, 2005; Breunig et al., 2019). The fourth measure, *any stress*, is also a binary variable which is captured as 1 when an individual gives a “Yes” response to at least one of the seven financial stress indicators.

### 3.2.3 | Mediators

To explore nuances in the channel of effect in the informal caregiving–financial stress nexus, we explore the mediating roles of financial fragility and social isolation. We focus on financial fragility and social exclusion because these two broad variables encapsulate all aspects of one's financial and social position that can directly be compromised by informal caregiving and has a translating effect on the likelihood of being financially stressed.

Financial fragility reflects an individual's incapacity to raise a specified sum of money within a particular period during an emergency or shock (Hasler et al., 2018; Koomson et al., 2022; Lusardi et al., 2011). Respondents in the HILDA were asked if they could provide the specified amount within 1 week during an emergency. To

account for changes in cost of living over the course of the survey, the specified amount was increased across survey periods. For example, \$2000 was asked in waves 2 to 8, \$3000 for waves 9–19, and \$4000 for waves 20 and 21. Of the four responses, those who indicated that they could not raise such amount, or they could raise it only after doing something drastic were coded as 1 to reflect financial fragility. The code 0 was assigned to individuals who said it was easy to raise the amount and others who indicated they could provide the amount but with some sacrifices. This is consistent with the approach used in the literature to measure financial fragility (see e.g., Hasler et al., 2018; Lusardi et al., 2011).

Social isolation refers to the absence of social contacts or the condition of having few people to frequently interact with. We use two questions to measure social isolation. The first question asked respondents on a seven-point scale, “In general, about how often do you get together socially with friends or relatives not living with you?” Responses to this question are (1) Every day; (2) Several times a week; (3) About once a week; (4) 2 or 3 times a month; (5) About once a month; (6) Once or twice every 3 months; and (7) Less often than once every 3 months. Those who selected responses (4) to (7) were assigned the value 1 to indicate social isolation while responses (1) to (3) were coded 0 to reflect otherwise (Freak-Poli et al., 2022; Kung et al., 2021). The second question uses a seven-point scale (1 “strongly disagree” to 7 “strongly agree”) to inquire as to whether friends do not visit respondents as often as they would like. As a check on our social isolation variable, those who were coded 0 (not isolated) based on the first question but selected responses 5 to 7 (from somewhat agree to strongly agree) in the second question were considered socially isolated and recoded as 1.

## 4 | ESTIMATION STRATEGY

The association between informal care and financial stress of the caregiver is first examined using two panel data econometric strategies—Pooled Ordinary Least Squares (OLS) and Fixed Effects (FE) models. The FE model accounts for individual unobserved heterogeneity while the Pooled OLS does not. We choose the FE over the random effects (RE) model due to its ability to effectively control for individual level time-invariant factors that could potentially introduce confounding effects into the association between the informal care variable and the other covariates. By effectively removing the potential effects of unobserved cofounders, the FE model can accurately estimate the effect of informal care on financial stress. Hence, our baseline model is specified as shown in Equation (1).

$$FS_{it} = \beta_1 \text{Infcare}_{it} + \sum_n \beta_n X_{n,it} + \omega_i + \lambda_t + \vartheta_s + \varepsilon_{it} \quad (1)$$

where  $FS_{it}$  is an indicator of financial stress of individual  $i$  at time  $t$ .  $\text{Infcare}_{it}$  is a continuous variable representing an individual's hours of informal caregiving. The control variables ( $X_{n,it}$ ) include a dummy

variable for whether the individual is a female, a continuous variable for age and its squared term, a dummy variable for whether the individual is employed, a continuous variable for log-transformed disposable income of the individual, a dummy variable for whether the individual reported as being in good health condition, dummy variables for the person's marital statuses, and education statuses. We also controlled for household-level variables such as continuous variable for household size, number of dependants in household, a dummy variable for whether any member in the household has any long-term health condition, disability or impairment, and a dummy for whether any member of the household is aged 65 years and above. Finally, we controlled for geographic level variables by including a dummy for rural residence and state fixed effects.  $\omega_i$ ,  $\lambda_t$  and  $\vartheta_s$  respectively represent individual, survey wave, and state fixed effects.  $\varepsilon_{it}$  is a random error term.

Informal caregiving ( $\text{Infcare}_{it}$ ) can be endogenous due to omitted variable bias or reverse causality (Do et al., 2015; Nguyen & Connelly, 2014; Urwin et al., 2019). With respect to omitted variable bias, ethnocultural contexts and altruistic personality traits have the potential to influence the decision to provide informal care and financial stress but are difficult to accurately measure and include in models. Regarding reverse causality, informal care provision can reduce labour force participation, decrease income and result in financial stress. Conversely, an individual's desire to avoid financial stress can influence the hours of informal care provided. The omitted variable problem can lead to correlations between  $\text{Infcare}_{it}$  and unobserved individual heterogeneities ( $\omega_i$ ). The FE estimator can resolve the correlation problem between  $\text{Infcare}_{it}$  and unobserved individual heterogeneities ( $\omega_i$ ) due to the sampling of same respondents over the course of the HILDA survey. However, the endogeneity problem resulting from reverse causality, that causes the correlation between  $\text{Infcare}_{it}$  and  $\varepsilon_{it}$  cannot be solved by the FE estimator (Jacobs et al., 2014; Zhu & Onur, 2023). This can be resolved using the instrumental variable approach.

Hence, we address both omitted variable bias and reverse causality problems using fixed effects instrumental variable (FE-IV) estimation. We implement the FE-IV by using injury to or illness of a close relative ( $\text{Inj\_ill}_{it-1}$ ) in the previous year as an instrumental variable. Since the reference period of the injury event is the previous year, the instrument operates as a lag variable to estimate the contemporaneous effect of informal caregiving on financial stress. For our instrument to be valid, it must satisfy the "relevance" and "exclusion restriction" criteria. First, we can argue that having an injured close relative in the previous year can influence one's decision to provide informal care for the affected relative which satisfies the relevance condition (Ciani, 2012; Heitmueller, 2007). This can be tested from our first stage regression where we regress informal care on the lag of an injured or sick close relative together with all the control variables explained earlier. Conversely, the unexpected nature of accidents or sickness renders the instrument a random event which satisfies the exclusion restriction condition. Therefore, we expect the

instrument to directly influence informal caregiving decisions but not financial stress contemporaneously.

To strengthen the validity of our instrument, we exploit the richness of the HILDA data and undertook the following steps. First, it is possible that a large household size may increase the chance of having an injured/ill household member, which then affects the likelihood of a household member providing informal care. If this holds, then our instrument will be non-random. To mitigate this possible confounding effect, we controlled for household size in our model. Second, due to the high correlation between old age, frailty and falls/injury (Nghiem et al., 2021), we controlled for having an aged household member in our model. Old age is a dummy variable that is defined as whether any member of the household is aged 65 years and above. This definition is consistent with Australian Institute of Health and Welfare (2023b) definition for an aged person. Finally, the overall health status of a household has strong correlation with the chances of having an injured household member which intend render our instrument non-random. To tease out this possible confounder, we controlled for whether anyone in the household has any long-term health condition, disability, or impairment in our model. By controlling for all these important household level variables, we argue that any injury in the household is a random event that affects ones' financial stress only through provision of informal care. We further test for the strength of our instrument by using the Stock and Yogo (2002) test for weak instrument. Therefore, our identification strategy exploits the longitudinal nature of our data within an instrumental variable approach to estimate the causal effect of informal caregiving on financial stress. In stage 1, we regress  $\text{Infcare}_{it}$  on  $\text{Inj\_ill}_{it-1}$  and other covariates as shown in Equation (2), and specify the first stage equation as:

$$\text{Infcare}_{it} = \beta_1 \text{Inj\_ill}_{it-1} + \sum_n \beta_n X_{n,it} + \omega_i + \lambda_t + \vartheta_s + \varepsilon_{it} \quad (2)$$

In stage 2, we obtain the predicted values of informal care ( $\hat{\text{Infcare}}_{it}$ ) from Equation (2) and use that to produce the unbiased effect of informal care on financial stress. The second stage equation is specified as Equation (3).

$$FS_{it} = \beta_1 \hat{\text{Infcare}}_{it} + \sum_n \beta_n X_{n,it} + \omega_i + \lambda_t + \vartheta_s + \varepsilon_{it} \quad (3)$$

Apart from the FE-IV estimator, we also employ different quasi-experimental methods as robustness check on our main findings. These include the propensity score matching (PSM) and the Lewbel (2012) IV methods. Using an OLS for binary outcomes yields a linear probability model (LPM). We use an LPM because of the ease of interpreting the coefficients as marginal effects (Caudill, 1988; Koomson & Afoakwa, 2022); and also because it enables direct comparison of estimates across the different model used in this study. We also employ the binary version of the informal care variable as a sensitivity test on the weekly hours of informal care provided. These methods are fully explained in Subsection 5.4.



## 5 | RESULTS AND DISCUSSION

### 5.1 | Descriptive statistics

In this section, we present summary statistics of key variables used in this study. Overall, 12.3% of individuals reported having financial difficulties, 19.4% had cashflow difficulty, 10.2% experienced general hardship, and 22.0% had at least one form of financial stress in the last 12 months. Nine percent of individuals provided some form of informal care while the hours of informal care provided averages 1.4 h per week. About 35% of the respondents were females, 63% were employed and 34% resided in rural/remote areas. Summary statistics of all the variables are available in Appendix Table A3.

### 5.2 | Baseline results

Table 1 reports the baseline estimates from the pooled OLS and FE regressions for the effect of informal care on financial stress. We find a positive link between informal care and all four measures of financial stress. Specifically, the pooled OLS estimates in Panel A show that a unit increase in the hours of informal care provided is associated with an increase in one's probability of having financial difficulties by 1.6% points, cashflow challenges by 1.8% points, hardship by 1.8% points and any form of financial stress by 2.3% points. The FE estimates in Panel B show that an extra hour of informal care is associated with an increased risk of financial difficulty and cashflow problems of 0.5 and 0.6% points, respectively. Also, informal caregiving increases the risk of experiencing financial hardship and any financial stress by 0.6 and 0.9% points, respectively. In spite of its ability to resolve omitted variable bias, thereby producing substantially smaller estimates compared to the pooled OLS results, the FE estimates cannot to be considered as causal estimates due to reverse causality. The complete results with all control variables are presented in Tables A1 and A2 in the Appendix.

### 5.3 | Endogeneity-corrected results

In Table 2, we present the results from the endogeneity corrected FE-IV estimates which resolves endogeneity issues emanating from both omitted variable and reverse causality problems. Results from the first stage regressions show that having an injured household member in previous year has a positive effect on the likelihood of providing informal care. The corresponding F-statistics from the first stage regression is substantially greater than 10, suggesting that our instrument passes the weak identification test. Having passed the weak identification test, we can now discuss the unbiased estimates from the FE-IV regressions. Columns (1)–(4) show that informal care significantly increases financial difficulty, cashflow problems, general hardships, and stress. We observe that estimates produced from the FE-IV model are larger than results from both pooled OLS and FE regressions. Specifically, we find that the effect of informal care on

financial stress ranges from 9.8 to 14.3% points, with the largest effect on any financial stress. This finding suggests that the pooled OLS and fixed effect estimates are biased downward.

### 5.4 | Mediation analyses

In this subsection, we discuss some potential channels through which informal care affects financial stress. Two key hypotheses are tested: (1) informal caregiving makes one financially fragile, thereby increasing his/her chances of being financially stressed; and (2) informal caregiving increases one's likelihood of being socially isolated, thereby increasing his/her chance of being financially stressed. We test these hypotheses by using structural equation modelling (SEM) approach to estimate the direct, indirect, and total effects (Churchill et al., 2023; Mota-Veloso et al., 2017).

As a first step, we show in Table 3 that informal care has a significantly positive effect on financial fragility and social isolation. That is, an increase in informal care by an hour is associated with 1.6 and 1.0% points increase in financial fragility and social isolation respectively.

Step two involves the separate inclusion of financial fragility and social isolation in the financial stress model to analyse their mediation effects using the estimated direct, indirect, and total effects as shown in Table 4. In Columns 1 to 4 of Panel A, we observe that financial fragility is associated with an increase in all forms of financial stress. We also see that the total effect of informal caregiving on financial stress ranges from 1.4 to 2.2% points. Of these total effects, the mediating/indirect effect of financial fragility respectively ranges from 0.5 to 0.6% points and are statistically significant. Put differently, the contribution of financial fragility to the total effect of informal care on financial stress ranges from 22.7% to 30%. These imply that financial fragility significantly mediates the relationship between informal care and financial stress.

Considering the mediation results of social isolation reported in Panel B, we see that social isolation is positively associated with all the financial stress indicators. The total effect of informal caregiving on financial stress ranges from 1.4 to 2.3% points while the mediating effects of social isolation are statistically significant and range from 0.2 to 0.3% points (i.e., from 8.7% to 15%), respectively. This also suggests that social isolation is a potential channel through which informal caregiving influences financial stress. Considering our two hypotheses aligned to the mediators, we can infer that informal caregiving increases financial fragility and social isolation, which in turn increases the caregiver's likelihood of being financially stressed.

### 5.5 | Gender, location, socioeconomic heterogeneities

It is possible that the effect of informal care may vary across different groups of people within a population depending on their respective coping mechanism and their tendency to provide informal care. In

**TABLE 1** Informal care and financial stress (Pooled OLS & FE results).

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Panel A: Pooled OLS results				
Informal care hours	0.016*** (0.002)	0.018*** (0.002)	0.018*** (0.002)	0.023*** (0.002)
All controls	Yes	Yes	Yes	Yes
Wave fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Individual fixed effects	No	No	No	No
Observations	244,622	244,402	243,913	244,622
R-squared	0.106	0.116	0.106	0.128
Number of individuals	31,313	31,304	31,265	31,313
Panel B: Fixed effects results				
Informal care hours	0.005*** (0.001)	0.006*** (0.001)	0.006*** (0.001)	0.009*** (0.002)
All controls	Yes	Yes	Yes	Yes
Wave fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes
Observations	244,622	244,402	243,913	244,622
R-squared	0.017	0.025	0.016	0.026
Number of individuals	31,313	31,304	31,265	31,313

Note: Robust standard errors in parentheses.

\*\*\**p* < 0.01.

**TABLE 2** Informal care and financial stress (FE-IV results).

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Informal care hours	0.099*** (0.015)	0.121*** (0.018)	0.098*** (0.015)	0.143*** (0.019)
All controls	Yes	Yes	Yes	Yes
Wave fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes
First stage				
Injury/illness to relative in previous year	0.120*** (0.005)	0.120*** (0.005)	0.120*** (0.005)	0.120*** (0.005)
F-statistic	559.72	558.11	559.28	559.72
Observations	226,007	225,811	225,379	226,007
Number of individuals	24,931	24,922	24,896	24,931

Note: Robust standard errors in parentheses.

\*\*\**p* < 0.01.

**TABLE 3** Effect of informal care on financial fragility and social isolation.

	(1) Financial fragility	(2) Social isolation
Informal care [EM]	0.016*** (0.001)	0.010*** (0.001)
All controls	Yes	Yes
Observations	231,811	227,975
Number of individuals	24,828	24,826

Note: Standard errors in parentheses.

Abbreviation: EM, Effect on mediator.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table 5, we conduct sub-sample analyses of the effect of informal care on financial stress to highlight the possible socio-demographic heterogeneities in our findings. In these analyses, we employed FE-IV regression, which is our preferred method. To ensure that the effect sizes for sub-groups are statistically different, we employ the Chow test to statistically test for the differences in coefficients across the different groups reported across Panels A to D (Chow, 1960; Kofinti et al., 2023; Nunoo et al., 2018). As shown in the table, the chi-square results are statistically significant at the 1% level, which indicates that effect sizes across all indicators of financial stress are significantly different between males and females and between those residing in rural and major cities. Panels A and B show that informal care has a greater effect on financial stress among males than females, and this is consistent across all measures of financial stress. Panels C and D also reveal that the effect of informal care on financial stress is greater among those living in rural and remote areas than that of their peers living in major cities.

In Table 6, we decompose our findings for respondents who reside in relatively higher and lower socioeconomic disadvantaged areas. The relative socioeconomic disadvantage of the areas is defined using the Australian Bureau of Statistics' Socio-Economic Indexes for Areas (SEIFA). Intuitively, we group areas in the lowest to 6th decile of the SEIFA as belonging to low socioeconomic areas (i.e., relatively high socioeconomic disadvantaged areas) while those in the seventh to highest decile are classified as high socioeconomic areas (i.e., low socioeconomic disadvantaged areas). The Chow test results show that effect sizes across all indicators of financial stress are significantly different between those residing in high and low socioeconomic areas. As presented in Panels A and B, we observe that informal care increases financial stress more for those located in low socioeconomic areas.

## 5.6 | Robustness checks

We now conduct a battery of robustness checks to explore the consistency of our main findings to different quasi-experimental methods for asserting causality. First, we use propensity score

matching (PSM) approach to address possible selection bias in our exposure variable (provision of informal care) (Kofinti et al., 2022; Koomson et al., 2024). The PSM generates propensity scores based on observable characteristics of respondents and uses that to counterfactually compare the average differences in financial stress between those who provide informal care (treatment group) and those who do not (control group). Figure A1 shows the region of common support for those who provide informal care and those who do not. The graph shows that there is a reasonable overlap between the propensity scores of those who provide informal care and those who do not, suggesting that the PSM findings are acceptable since informal carers have adequate room for common support by non-carers. Respondents whose propensity scores fell outside the common support region were excluded. The average treatment effect on the treated (ATET) is interpreted as the impact of informal care on one's financial stress. Different matching approaches were applied; 1:1 nearest neighbour, 1:5 nearest neighbour, and inverse probability weighted regression adjustment (IPWRA) method. Across all matching approaches, we find that provision of informal care significantly increases one's probability of being financially stressed (Table 7). The estimates from the PSM are consistent with those from the FE-IV models.

Second, we apply the Lewbel (2012) IV approach to resolve the endogeneity problem associated with informal care. The Lewbel IV approach achieves identification by generating internal instruments that are uncorrelated with the product of heteroskedastic error term (Ansong et al., 2023; Koomson, 2024). Two results are reported in Table 8: one when only internal instruments are used (Panel A) and when both internal and external (injured household member in previous year) instruments are used (Panel B). Across both results, we find that informal care significantly increases the probability of financial stress across all indicators. However, the size of coefficients is larger when both internal and external instruments are used for identification, echoing the validity of our external instrument. Overall, the Lewbel IV estimates produces estimates larger than those from the pooled OLS and FE models which suggest that our findings are consistently established across different IV methods.

Third, we test for sensitivity in our results by using a dummy variable for whether a person provides informal care or not. This approach helps to capture the extensive margin of informal caregiving. Analysing this along all measures of financial stress, we observe in Table 9 that provision of informal care increases one's probability of experiencing financial stress between 23.1 and 33.4% points.

## 6 | DISCUSSION AND CONCLUDING REMARKS

Australia has a significantly growing number of informal care providers who spend approximately 35 h a week providing care. Beyond this, the extent of financial stress is concerning, with one in four people reported to having difficulties to get by on their income. Considering the financial stress and mental health are often



**TABLE 4** Linear IV mediation analysis with direct, indirect, and total effects.

	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Panel A: Mediator—financial fragility				
Informal care hours [DE]	0.012*** (0.001)	0.008*** (0.001)	0.017*** (0.001)	0.014*** (0.001)
Financial fragility [ME]	0.308*** (0.001)	0.373*** (0.002)	0.269*** (0.001)	0.411*** (0.002)
Mediation indicators				
Total effect [TE]	0.017*** (0.001)	0.014*** (0.001)	0.022*** (0.001)	0.020*** (0.001)
Direct effect [DE]	0.012*** (0.001)	0.008*** (0.001)	0.017*** (0.001)	0.014*** (0.001)
Indirect effect [IE = EM * ME]	0.005*** (0.001)	0.006*** (0.001)	0.005*** (0.001)	0.006*** (0.001)
Observations	231,811	231,615	231,187	231,811
Number of individuals	24,828	24,526	24,423	24,828
Panel B: Mediator—social isolation				
Informal care hours [DE]	0.017*** (0.001)	0.014*** (0.001)	0.021*** (0.001)	0.020*** (0.001)
Social isolation [ME]	0.278*** (0.002)	0.198*** (0.002)	0.200*** (0.002)	1.899*** (0.002)
Mediation indicators				
Total effect [TE]	0.020*** (0.001)	0.014*** (0.001)	0.023*** (0.001)	0.021*** (0.001)
Direct effect [DE]	0.017*** (0.001)	0.014*** (0.001)	0.021*** (0.001)	0.020*** (0.001)
Indirect effect [IE = EM * ME]	0.003*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
Observations	227,975	227,786	227,377	227,975
Number of individuals	24,826	24,782	24,795	24,826

Note: Standard errors in parentheses.

Abbreviations: DE, Direct effect; IE, Indirect effect; ME, Mediator effect; TE, Total effect.

\*\*\* $p < 0.01$ .

intricately linked, it has become imperative to investigate the effect of informal care on financial stress. Such understanding can provide pathways through which public policies can be designed to improve overall financial security. This study investigated the effect of informal caregiving and financial stress using Australia as a case study. To do this, we used rich longitudinal population-based data from the HILDA study, that has detailed fine-grained measures of informal caregiving and financial stress. Our identification strategy exploits the longitudinal nature of our data and instrumental variable approach to estimate the effect of informal caregiving on financial stress.

Our finding can be summarised in threefold. First, we find that informal caregiving has significantly positive effect on financial stress, irrespective of the measure used. Second, the adverse effect of informal care on financial stress is greater among males, those living in rural/remote areas and those residing in low socioeconomic areas. Finally, our mediation analyses show that financial fragility and social isolation are important pathways through which informal care increases financial stress.

Our finding that the effect of informal care on financial stress is more pronounced for males is quite intriguing, considering that significant proportion of females relative to males serve as primary

TABLE 5 Informal care and financial stress (FE-IV results): Gender &amp; Location.

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Panel A: Male sample				
Informal care hours	0.126*** (0.029)	0.124*** (0.035)	0.112*** (0.028)	0.150*** (0.037)
All controls	Yes	Yes	Yes	Yes
First stage				
Injury/illness to relative in previous year	0.095*** (0.007)	0.095*** (0.007)	0.095*** (0.007)	0.095*** (0.007)
F-statistic	184.67	183.61	185.92	184.67
Observations	105,160	105,056	104,909	105,160
Number of individuals	11,975	11,969	11,959	11,975
Panel B: Female sample				
Informal care hours	0.088*** (0.018)	0.121*** (0.021)	0.093*** (0.017)	0.142*** (0.022)
All controls	Yes	Yes	Yes	Yes
First stage				
Injury/illness to relative in previous year	0.140*** (0.007)	0.140*** (0.007)	0.140*** (0.007)	0.140*** (0.007)
F-statistic	387.77	387.24	386.02	387.77
Observations	120,847	120,755	120,470	120,847
Number of individuals	12,960	12,957	12,941	12,960
Chow test: LR chi2: (A) = (B)	610.75***	1246.83***	40890.26***	1485.20***
Panel C: Urban/Major city				
Informal care hours	0.100*** (0.018)	0.115*** (0.022)	0.097*** (0.017)	0.138*** (0.022)
All controls	Yes	Yes	Yes	Yes
First stage				
Injury/illness to relative in previous year	0.125*** (0.006)	0.125*** (0.006)	0.125*** (0.006)	0.125*** (0.006)
F-statistic	410.63	410.95	408.94	410.63
Observations	148,962	148,839	148,551	148,962
Number of individuals	17,608	17,603	17,579	17,608
Panel D: Rural/Regional/Remote area				
Informal care hours	0.101*** (0.029)	0.133*** (0.034)	0.111*** (0.028)	0.159*** (0.036)
All controls	Yes	Yes	Yes	Yes
First stage				
Injury/illness to relative in previous year	0.112*** (0.009)	0.112*** (0.009)	0.112*** (0.009)	0.112*** (0.009)
F-statistic	151.83	150.78	152.49	151.83
Observations	75,895	75,822	75,679	75,895

TABLE 5 (Continued)

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Number of individuals	9539	9534	9530	9539
Chow test: LR chi2: (C) = (D)	773.68***	86,303.63***	42,477.66***	1807.31***

Note: Robust standard errors in parentheses. NB: All models contain individual, wave, and state fixed effects.

\*\*\* $p < 0.01$ .

TABLE 6 Informal care and financial stress (FE-IV results): Low &amp; high socioeconomic area defined by SEIFA.

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Panel A: Low socioeconomic area [SEIFA]				
Informal care hours	0.125*** (0.023)	0.150*** (0.027)	0.116*** (0.022)	0.167*** (0.028)
All controls	Yes	Yes	Yes	Yes
First stage				
Injury/illness to relative in previous year	0.118** (0.007)	0.118** (0.007)	0.118** (0.007)	0.118** (0.007)
F-statistic	279.45	277.80	278.99	279.45
Observations	130,173	130,023	129,716	130,173
Number of individuals	16,985	16,975	16,950	16,985
Panel B: High socioeconomic area [SEIFA]				
Informal care hours	0.054*** (0.020)	0.066*** (0.025)	0.076*** (0.018)	0.103*** (0.026)
All controls	Yes	Yes	Yes	Yes
First stage				
Injury/illness to relative in previous year	0.123*** (0.007)	0.123*** (0.007)	0.123*** (0.007)	0.123*** (0.007)
F-statistic	281.11	281.55	280.30	281.11
Observations	93,391	93,344	93,219	93,391
Number of individuals	12,239	12,235	12,234	12,239
Chow test: LR chi2: (A) = (B)	27,838.27***	60,261.21***	72,018.00***	85,010.96***

Note: Robust standard errors in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

carers (72%, compared with 50% of other carers in 2018) (Australian Institute of Health and Welfare, 2021). However, some suggestive reasons can be inferred. For instance, evidence shows that the adverse effect of informal caregiving on labour force participation is significant for males but not females (Kolodziej et al., 2018) which implies that the income-reducing effect is expected to be more pronounced among men. Also, this finding aligns with the evidence from the UK which shows that informal caregiving adversely impacts the socioeconomic wellbeing of male caregivers more than their female counterparts despite females' having higher likelihood of

providing informal care (Carers UK, 2015). Likewise, the finding that informal care compromises one's financial status thereby making him/her financially stressed can be explained by the findings by Simard-Duplain (2022) that people who provide informal care have reduced working hours and change of job. Reduced working hours have a translation effect on one's earned income which in turn leads to financial stress. Similarly, our finding that social isolation mediates the effect of informal care on financial stress aligns with the findings in the UK that more than 50% of caregivers reported to have lost contact with their friends and families due to caregiving (Carers

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Nearest neighbour (1:1)	0.045*** (0.004)	0.052*** (0.005)	0.040*** (0.004)	0.059*** (0.004)
Nearest neighbour (1:5)	0.043*** (0.003)	0.049*** (0.003)	0.037*** (0.002)	0.058*** (0.004)
IPW regression adjustment (IPWRA)	0.069*** (0.004)	0.071*** (0.005)	0.069*** (0.004)	0.084*** (0.005)
Observations	244,622	244,402	243,913	244,622

TABLE 7 PSM results with different matching methods.

Note: Bootstrapped standard errors in parentheses. NB: Propensities scores were obtained using gender age, household size, employment status, health condition, dependants, rural location, marital status, education status, and state of usual residence.

\*\*\* $p < 0.01$ .

TABLE 8 Informal care and financial stress (Lewbel 2SLS).

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Panel A: Internal-only instruments				
Informal care hours	0.010*** (0.003)	0.014*** (0.003)	0.012*** (0.003)	0.019*** (0.003)
All controls	Yes	Yes	Yes	Yes
First stage				
F-Statistic	327.00	326.20	325.84	327.00
J p-value	0.312	0.372	0.288	0.210
Observations	244,622	244,402	243,913	244,622
Number of individuals	31,313	31,304	31,265	31,313
Panel B: Internal & external instruments				
Informal care hours	0.014*** (0.001)	0.018*** (0.002)	0.015*** (0.001)	0.023*** (0.002)
All controls	Yes	Yes	Yes	Yes
First stage				
Injury/illness to relative in previous year	0.122*** (0.003)	0.122*** (0.003)	0.122*** (0.003)	0.122*** (0.003)
F-statistic	5582.51	5579.76	5561.91	5582.51
Observations	231,057	230,859	230,429	231,057
Number of individuals	31,313	31,304	31,265	31,313

Note: Standard errors in parentheses are clustered at individual level. NB: All models contain wave, and state fixed effects.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ .

UK, 2015). That is, our study has shown that people who turn to be socially isolated due to caregiving end up being financially stressed.

Considering the growing literature on mental health especially after the COVID-19 pandemic, our study has used longitudinal data from Australia to show that informal care could be a contributing factor to the increasing incidence of financial stress. Our study makes three contributions to the literature. First, we have explored the

effect of informal care on financial stress, which is an important economic outcome yet received little attention in the literature. Second, we have investigated the effect of informal care on financial stress in the Australian context, where the current levels of informal care and mental health are public health issues. Finally, we have utilised rich longitudinal data spanning from 2005 to 2021, backed by rigorous analytical strategy that addresses endogeneity emanating

**TABLE 9** Informal care and financial stress (Alternative measure of informal care: FE-IV results).

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Informal care (yes/no)	0.231*** (0.035)	0.281*** (0.041)	0.228*** (0.033)	0.334*** (0.043)
All controls	Yes	Yes	Yes	Yes
Wave fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes
First stage				
Injury/illness to relative in previous year	0.053*** (0.002)	0.053*** (0.002)	0.053*** (0.002)	0.053*** (0.002)
F-statistic	646.24	646.43	647.19	646.24
Observations	226,007	225,811	225,379	226,007
Number of individuals	24,931	24,922	24,896	24,931

Note: Robust standard errors in parentheses.

\*\*\* $p < 0.01$ .

from omitted variable bias and reverse causality to establish the causal effect of informal care on financial stress. The series of robustness checks confirm our finding that informal care increases financial stress.

Considering that the number of people providing informal care is increasing in Australia, it will be prudent for policymakers to design and streamline existing policies on informal care to reduce its potential impact on financial stress. For instance, some labour market considerations such as flexible work arrangements can help reduce the level of financial stress among informal carers who are working. Also, the means-tested Carer Payment policy for informal carers of children under 7 years can be revised to benefit all forms of informal carers irrespective of the age of person needing care. Rather, a cost-effective approach would be to target those in rural and remote areas as well as those living in low socioeconomic areas. The Australian government through the "Financial Wellbeing and Capability Activity" (FWCA) scheme provides support to eligible individuals experiencing financial crisis (Australian Government Department of Social Services, 2023). Under this scheme, eligible individuals and families are supported with financial counselling, financial literacy education and access to financial services such as loans with low or no interest. Our findings highlight that while such initiative is prudent, a more streamlined and targeted approach, for example, focussing on those living in rural or remote areas and those facing high socioeconomic disadvantages, would be equitable and cost-effective. In this study, we were unable to control for the extent of formal care received by recipients of informal care in a carer's household. This variable is not captured in our data source although the extent of formal care received is associated with informal care giving and has potential to affect our outcome variable. We entreat future researchers to account for this variable in their model.

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## CONFLICT OF INTEREST STATEMENT

Authors declare no conflict of interest for this study.

## DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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## REFERENCES

- Ansong, D., Koomson, I., Okumu, M., Alhassan, M., Makubuya, T., & Abreh, M. K. (2023). Private supplementary tutoring expenditures and children's learning outcomes: Gender and locational evidence from Ghana. *Studies In Educational Evaluation*, 76, 101232. <https://doi.org/10.1016/j.stueduc.2022.101232>
- Australian Government Department of Social Services. (2023). *Financial wellbeing and capability activity*. Department of Social Services, Australian Government. Retrieved from <https://www.dss.gov.au/communities-and-vulnerable-people/programmes-services/financial-wellbeing-and-capability>
- Australian Institute of Health and Welfare. (2021). *Informal carers*. Australian Institute of Health and Welfare. Retrieved from <https://www.aihw.gov.au/reports/australias-welfare/informal-carers>
- Australian Institute of Health and Welfare. (2023a). *Employment and unemployment*. AIHW, Australian Government. Retrieved from <https://www.aihw.gov.au/reports/australias-welfare/employment-unemployment>

- Australian Institute of Health and Welfare. (2023b). *Older Australians*. AIHW, Australian Government. Retrieved from <https://www.aihw.gov.au/reports/older-people/older-australians/contents/summary>
- Biddle, N., & Gray, M. (2022). Economic and other wellbeing in Australia—October 2022 ANU centre for social research and methods. Retrieved from <https://csmr.cass.anu.edu.au/research/publications/economic-and-other-wellbeing-australia-october-2022>
- Bolin, K., Lindgren, B., & Lundborg, P. (2008). Informal and formal care among single-living elderly in Europe. *Health Economics*, 17(3), 393–409. <https://doi.org/10.1002/hec.1275>
- Bom, J., Bakx, P., Schut, F., & Van Doorslaer, E. (2019). Health effects of caring for and about parents and spouses. *The Journal of the Economics of Ageing*, 14, 100196. <https://doi.org/10.1016/j.jeoa.2019.100196>
- Brenna, E. (2021). Should I care for my mum or for my kid? Sandwich generation and depression burden in Italy. *Health Policy*, 125(3), 415–423. <https://doi.org/10.1016/j.healthpol.2020.11.014>
- Breunig, R., & Cobb-Clark, D. (2005). Understanding the factors associated with financial stress in Australian households. *Australian Social Policy*, 13–64.
- Breunig, R., Hasan, S., & Hunter, B. (2019). Financial stress and indigenous Australians. *The Economic Record*, 95(308), 34–57. <https://doi.org/10.1111/1475-4932.12444>
- Carers, U. K. (2015). The state of caring 2015. Retrieved from <https://www.bl.uk/collection-items/state-of-caring-2015>
- Carmichael, F., Charles, S., & Hulme, C. (2010). Who will care? Employment participation and willingness to supply informal care. *Journal of Health Economics*, 29(1), 182–190. <https://doi.org/10.1016/j.jhealeco.2009.11.003>
- Caudill, S. B. (1988). An advantage of the linear probability model over probit or logit. *Oxford Bulletin of Economics & Statistics*, 50(4), 425–427. <https://doi.org/10.1111/j.1468-0084.1988.mp50004005.x>
- Chow, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica: Journal of the Econometric Society*, 28(3), 591–605. <https://doi.org/10.2307/1910133>
- Churchill, S. A., Hayward, M., Smyth, R., & Trinh, T.-A. (2023). Crime, community social capital and entrepreneurship: Evidence from Australian communities. *Journal of Business Venturing*, 38(2), 106291. <https://doi.org/10.1016/j.jbusvent.2023.106291>
- Ciani, E. (2012). Informal adult care and caregivers' employment in Europe. *Labour Economics*, 19(2), 155–164. <https://doi.org/10.1016/j.labeco.2011.12.001>
- Commonwealth of Australia. (2021). *Final report: Care, dignity and respect*. Royal Commission into Aged Care Quality and Safety. Retrieved from <https://agedcare.royalcommission.gov.au/publications/final-report>
- Deloitte Access Economics. (2020). *The value of informal care in 2020*. Deloitte Access Economics. Retrieved from <https://apo.org.au/node/307225>
- DiGiacomo, M., Chang, S., Luckett, T., Agar, M., Phillips, J., & Lam, L. (2020). Financial stress experienced by informal carers of adults with a chronic disease: Results from an Australian population-based cross-sectional survey. *Australasian Journal on Ageing*, 39(3), 254–262. <https://doi.org/10.1111/ajag.12739>
- Do, Y. K., Norton, E. C., Stearns, S. C., & Van Houtven, C. H. (2015). Informal care and caregiver's health. *Health Economics*, 24(2), 224–237. <https://doi.org/10.1002/hec.3012>
- Feigin, V. L., Roth, G. A., Naghavi, M., Parmar, P., Krishnamurthi, R., Chugh, S., Mensah, G. A., Norrving, B., Shiu, I., Ng, M., Estep, K., Cercy, K., Murray, C. J. L., & Forouzanfar, M. H. (2016). Global burden of stroke and risk factors in 188 countries, during 1990–2013: A systematic analysis for the global burden of disease study 2013. *The Lancet Neurology*, 15(9), 913–924. [https://doi.org/10.1016/s1474-4422\(16\)30073-4](https://doi.org/10.1016/s1474-4422(16)30073-4)
- Freak-Poli, R., Kung, C. S., Ryan, J., & Shields, M. A. (2022). Social isolation, social support, and loneliness profiles before and after spousal death and the buffering role of financial resources. *The Journals of Gerontology: Series B*, 77(5), 956–971. <https://doi.org/10.1093/geronb/gbac039>
- Hasler, A., Lusardi, A., & Oggero, N. (2018). Financial fragility in the US: Evidence and implications. In *Global financial literacy excellence center, the george Washington university school of business*.
- Heitmueller, A. (2007). The chicken or the egg? Endogeneity in labour market participation of informal carers in England. *Journal of Health Economics*, 26(3), 536–559. <https://doi.org/10.1016/j.jhealeco.2006.10.005>
- Iburg, K. M., Charalampous, P., Allebeck, P., Stenberg, E. J., O'Caomh, R., Monasta, L., Penalvo, J. L., Pereira, D. M., Wyper, G. M., Niranjani, V., Devleeschauwer, B., & Haagsma, J. (2023). Burden of disease among older adults in Europe—Trends in mortality and disability, 1990–2019. *The European Journal of Public Health*, 33(1), 121–126. <https://doi.org/10.1093/eurpub/ckac160>
- Jacobs, J. C., Laporte, A., Van Houtven, C. H., & Coyte, P. C. (2014). Caregiving intensity and retirement status in Canada. *Social Science & Medicine*, 102, 74–82. <https://doi.org/10.1016/j.socscimed.2013.11.051>
- Kofinti, R. E., Koomson, I., Paintsil, J. A., & Ameyaw, E. K. (2022). Reducing children's malnutrition by increasing mothers' health insurance coverage: A focus on stunting and underweight across 32 sub-Saharan African countries. *Economic Modelling*, 117, 106049. <https://doi.org/10.1016/j.econmod.2022.106049>
- Kofinti, R. E., Koomson, I., & Peparah, J. A. (2023). Borrower discouragement and multidimensional child deprivation in Ghana. *The Journal of Economic Inequality*, 1–19. <https://doi.org/10.1007/s10888-023-09578-6>
- Kolodziej, I. W., Reichert, A. R., & Schmitz, H. (2018). New evidence on employment effects of informal care provision in Europe. *Health Services Research*, 53(4), 2027–2046. <https://doi.org/10.1111/1475-6773.12840>
- Koomson, I. (2024). Energy poverty and mental distress in South Africa: Assessing linkages and potential pathways. *World Development Sustainability*, 4, 100116. <https://doi.org/10.1016/j.wds.2023.100116>
- Koomson, I., & Afoakwa, C. (2022). Can financial inclusion improve children's learning outcomes and late school enrolment in a developing country? *Applied Economics*, 55(3), 1–18. <https://doi.org/10.1080/00036846.2022.2086683>
- Koomson, I., Churchill, S. A., & Munyanyi, M. E. (2022). Gambling and financial stress. *Social Indicators Research*, 163(1), 473–503. <https://doi.org/10.1007/s11205-022-02898-6>
- Koomson, I., Zhang, Q., & Prakash, K. (2024). Entrepreneurship and subjective wellbeing in China: Exploring linkages and potential channels. *Journal of Business Venturing Insights*, 21, e00449. <https://doi.org/10.1016/j.jbvi.2024.e00449>
- Korgaonkar, S., Bhattacharya, K., & Rosenthal, M. (2022). Food insecurity in a sample of informal caregivers in 4 Southern US states. *Preventing Chronic Disease*, 19, 220069. <https://doi.org/10.5888/pcd19.220069>
- Kung, C. S., Kunz, J. S., & Shields, M. A. (2021). Economic aspects of loneliness in Australia. *The Australian Economic Review*, 54(1), 147–163. <https://doi.org/10.1111/1467-8462.12414>
- Leigh, A. (2010). Informal care and labor market participation. *Labour Economics*, 17(1), 140–149. <https://doi.org/10.1016/j.labeco.2009.11.005>
- Lewbel, A. (2012). Using heteroscedasticity to identify and estimate mismeasured and endogenous regressor models. *Journal of Business & Economic Statistics*, 30(1), 67–80. <https://doi.org/10.1080/07350015.2012.643126>
- Lusardi, A., Schneider, D. J., & Tufano, P. (2011). *Financially fragile households: Evidence and implications*. National Bureau of Economic Research.



- Money and Mental Health Policy Institute. (2019). Money and mental health facts and statistics—A money and mental health policy Institute factsheet. In *Money and mental health policy Institute*. Retrieved from <https://www.moneyandmentalhealth.org/money-and-mental-health-facts/>
- Mota-Veloso, I., Celeste, R. K., Fonseca, C. P., Soares, M. E. C., Marques, L. S., Ramos-Jorge, M. L., & Ramos-Jorge, J. (2017). Effects of attention deficit hyperactivity disorder signs and socio-economic status on sleep bruxism and tooth wear among schoolchildren: Structural equation modelling approach. *International Journal of Paediatric Dentistry*, 27(6), 523–531. <https://doi.org/10.1111/ipd.12291>
- Nghiem, S., Afoakwah, C., Scuffham, P., & Byrnes, J. (2021). Hospital frailty risk score and adverse health outcomes: Evidence from longitudinal record linkage cardiac data. *Age and Ageing*, 50(5), 1778–1784. <https://doi.org/10.1093/ageing/afab073>
- Nguyen, H. T., & Connelly, L. B. (2014). The effect of unpaid caregiving intensity on labour force participation: Results from a multinomial endogenous treatment model. *Social Science & Medicine*, 100, 115–122. <https://doi.org/10.1016/j.socscimed.2013.10.031>
- Nunoo, J., Koomson, I., & Orkoh, E. (2018). Household deficiency in demand for water: Do water source and travel time matter? *Global Social Welfare*, 5(3), 179–187. <https://doi.org/10.1007/s40609-017-0092-6>
- Roth, D. L., Fredman, L., & Haley, W. E. (2015). Informal caregiving and its impact on health: A reappraisal from population-based studies. *The Gerontologist*, 55(2), 309–319. <https://doi.org/10.1093/geront/gnu177>
- Sakata, K., McKenzie, C., & Kajitani, S. (2022). Informal care and savings. *Applied Economics*, 54(33), 3762–3776. <https://doi.org/10.1080/00036846.2021.1980489>
- Schmitz, H., & Westphal, M. (2015). Short-and medium-term effects of informal care provision on female caregivers' health. *Journal of Health Economics*, 42, 174–185. <https://doi.org/10.1016/j.jhealeco.2015.03.002>
- Simard-Duplain, G. (2022). Heterogeneity in informal care intensity and its impact on employment. *Journal of Health Economics*, 86, 102647. <https://doi.org/10.1016/j.jhealeco.2022.102647>
- Stock, J. H., & Yogo, M. (2002). *Testing for weak instruments in linear IV regression*. National Bureau of Economic Research. Retrieved from <https://www.nber.org/papers/t0284.pdf>
- Urwin, S., Lau, Y.-S., & Mason, T. (2019). Investigating the relationship between formal and informal care: An application using panel data for people living together. *Health Economics*, 28(8), 984–997. <https://doi.org/10.1002/hec.3887>
- Van den Berg, B., Fiebig, D. G., & Hall, J. (2014). Well-being losses due to care-giving. *Journal of Health Economics*, 35, 123–131. <https://doi.org/10.1016/j.jhealeco.2014.01.008>
- Van Houtven, C., Carmichael, F., Jacobs, J., & Coyte, P. C. (2019). The economics of informal care. In *Oxford research encyclopedia of economics and finance*.
- Van Houtven, C. H. (2015). Informal care and economic stressors. In *Family caregiving in the new normal* (pp. 105–133). Elsevier.
- Van Houtven, C. H., Coe, N. B., & Skira, M. M. (2013). The effect of informal care on work and wages. *Journal of Health Economics*, 32(1), 240–252. <https://doi.org/10.1016/j.jhealeco.2012.10.006>
- Van Houtven, C. H., & Norton, E. C. (2008). Informal care and Medicare expenditures: Testing for heterogeneous treatment effects. *Journal of Health Economics*, 27(1), 134–156. <https://doi.org/10.1016/j.jhealeco.2007.03.002>
- Watson, N., & Wooden, M. P. (2012). The HILDA survey: A case study in the design and development of a successful household panel survey. *Longitudinal and Life Course Studies*, 3(3), 369–381.
- Wilkins, R., Lass, I., Butterworth, P., & Vera-Toscano, E. (2015). *The household, income and labour dynamics in Australia survey: Selected findings from waves 1 to 12*. Melbourne Institute of Applied Economic and Social Research, The University ....
- Zhu, R., & Onur, I. (2023). Does retirement (really) increase informal caregiving? Quasi-Experimental evidence from Australia. *Journal of Health Economics*, 87, 102713. <https://doi.org/10.1016/j.jhealeco.2022.102713>

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## APPENDIX A

TABLE A1 Informal care and financial stress (OLS results).

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Informal care	0.016*** (0.002)	0.018*** (0.002)	0.018*** (0.002)	0.023*** (0.002)
Female	0.005** (0.003)	0.017*** (0.003)	-0.006*** (0.002)	0.013*** (0.003)
Age	0.004*** (0.000)	0.002*** (0.000)	0.004*** (0.000)	0.003*** (0.001)
Age squared	-0.007*** (0.000)	-0.007*** (0.001)	-0.007*** (0.000)	-0.008*** (0.001)
Household size	-0.013*** (0.001)	-0.014*** (0.001)	-0.010*** (0.001)	-0.015*** (0.002)
Employed	-0.064*** (0.003)	-0.047*** (0.003)	-0.083*** (0.003)	-0.061*** (0.003)
log(disposable income)	-0.034*** (0.001)	-0.045*** (0.002)	-0.033*** (0.001)	-0.053*** (0.002)
Health in good condition	-0.085*** (0.003)	-0.100*** (0.004)	-0.081*** (0.003)	-0.116*** (0.004)
Dependants	0.043*** (0.002)	0.056*** (0.002)	0.026*** (0.002)	0.055*** (0.002)
Rural	0.003 (0.003)	0.002 (0.003)	0.005** (0.003)	0.002 (0.004)
Married	-0.062*** (0.005)	-0.061*** (0.006)	-0.068*** (0.004)	-0.075*** (0.006)
Defacto	0.029*** (0.005)	0.056*** (0.005)	0.006 (0.004)	0.051*** (0.005)
Separated	0.076*** (0.010)	0.097*** (0.011)	0.056*** (0.009)	0.101*** (0.011)
Divorced	0.046*** (0.008)	0.062*** (0.009)	0.043*** (0.008)	0.074*** (0.010)
Widowed	-0.021*** (0.007)	-0.008 (0.009)	-0.022*** (0.007)	-0.009 (0.009)
Postgraduate	-0.047*** (0.005)	-0.059*** (0.007)	-0.034*** (0.005)	-0.065*** (0.007)
Graduate diploma	-0.042*** (0.005)	-0.049*** (0.006)	-0.026*** (0.005)	-0.050*** (0.007)
Bachelor	-0.044*** (0.004)	-0.044*** (0.005)	-0.032*** (0.004)	-0.045*** (0.005)

TABLE A1 (Continued)

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Diploma	-0.011** (0.005)	-0.006 (0.006)	-0.003 (0.005)	-0.004 (0.006)
Certificate	0.017*** (0.004)	0.028*** (0.005)	0.012*** (0.004)	0.031*** (0.005)
Year 12	-0.008* (0.004)	0.010* (0.005)	-0.011*** (0.004)	0.009* (0.005)
Disabled person in household	0.045*** (0.002)	0.053*** (0.003)	0.043*** (0.002)	0.061*** (0.003)
Aged person in household (65+ yrs)	-0.020*** (0.004)	-0.014*** (0.004)	-0.029*** (0.003)	-0.019*** (0.005)
Wave fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Individual fixed effects	No	No	No	No
Observations	244,622	244,402	243,913	244,622
R-squared	0.106	0.116	0.106	0.128
Number of individuals	31,313	31,304	31,265	31,313

Note: Robust standard errors in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

TABLE A2 Informal care and financial stress (FE results).

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Informal care	0.005*** (0.001)	0.006*** (0.001)	0.006*** (0.001)	0.009*** (0.002)
Female	0.204** (0.101)	0.247** (0.120)	0.101 (0.122)	0.204 (0.132)
Age	-0.013*** (0.001)	-0.020*** (0.001)	-0.008*** (0.001)	-0.022*** (0.001)
Age squared	0.000 (0.001)	0.004*** (0.001)	-0.003*** (0.001)	0.003*** (0.001)
Household size	-0.015*** (0.001)	-0.018*** (0.002)	-0.010*** (0.001)	-0.019*** (0.002)
Employed	-0.036*** (0.003)	-0.034*** (0.003)	-0.047*** (0.002)	-0.043*** (0.003)
log(disposable income)	-0.012*** (0.001)	-0.016*** (0.001)	-0.012*** (0.001)	-0.020*** (0.001)
Health in good condition	-0.030*** (0.003)	-0.033*** (0.003)	-0.032*** (0.003)	-0.038*** (0.003)

(Continues)

TABLE A2 (Continued)

Variables	(1) Financial difficulty	(2) Cashflow	(3) Hardship	(4) Any stress
Dependents	0.025*** (0.002)	0.035*** (0.002)	0.013*** (0.002)	0.035*** (0.002)
Rural	-0.015*** (0.005)	-0.021*** (0.005)	-0.006 (0.004)	-0.020*** (0.006)
Married	-0.022*** (0.006)	-0.027*** (0.007)	-0.030*** (0.005)	-0.036*** (0.007)
Defacto	0.002 (0.005)	0.012** (0.006)	-0.010** (0.004)	0.006 (0.006)
Separated	0.055*** (0.010)	0.048*** (0.010)	0.058*** (0.009)	0.056*** (0.011)
Divorced	0.037*** (0.010)	0.033*** (0.011)	0.049*** (0.009)	0.041*** (0.011)
Widowed	0.004 (0.009)	-0.004 (0.010)	0.006 (0.008)	-0.003 (0.011)
Postgraduate	0.041*** (0.010)	0.065*** (0.013)	0.038*** (0.009)	0.065*** (0.013)
Graduate diploma	0.029** (0.011)	0.067*** (0.015)	0.035*** (0.009)	0.066*** (0.015)
Bachelor	0.034*** (0.007)	0.085*** (0.009)	0.027*** (0.006)	0.085*** (0.009)
Diploma	0.051*** (0.010)	0.085*** (0.012)	0.037*** (0.009)	0.090*** (0.012)
Certificate	0.035*** (0.007)	0.070*** (0.008)	0.027*** (0.007)	0.074*** (0.008)
Year 12	0.057*** (0.005)	0.117*** (0.006)	0.050*** (0.005)	0.124*** (0.006)
Disabled person in household	0.008*** (0.002)	0.010*** (0.002)	0.010*** (0.002)	0.012*** (0.002)
Aged person in household (65+ yrs)	-0.010*** (0.003)	-0.009** (0.004)	-0.016*** (0.003)	-0.014*** (0.004)
Individual fixed effects	Yes	Yes	Yes	Yes
Wave fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Observations	244,622	244,402	243,913	244,622
R-squared	0.017	0.025	0.016	0.026
Number of individuals	31,313	31,304	31,265	31,313

Note: Robust standard errors in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

TABLE A3 Summary statistics.

Variable	Description	Mean	Std. Dev.
Financial difficulty	=1 if individual is stressed in at least two of the stress indicators	0.123	0.329
Cashflow	=1 if individual is stressed in one of the cashflow indicators	0.194	0.395
Hardship	=1 if individual is stressed in one of the hardship indicators	0.102	0.303
Any stress	=1 if individual is stressed in at least one of the stress indicators	0.220	0.414
Informal care (hours)	Continuous variable for number of hours of providing informal care for disabled/elderly relative	1.431	8.814
Informal care (yes/no)	=1 if respondent actively cares for resident or non-resident relative due to long-term health condition	0.090	0.287
Female	=1 if respondent is female	0.534	0.499
Age	Age of respondent	44.919	18.665
Age squared	Age of respondent squared	23.661	18.094
Household size	Continuous variable for the log of household size	2.864	1.451
Employed	=1 if respondent is employed	0.629	0.483
log(disposable income)	Log of disposable income	11.076	0.997
Health in good condition	=1 if respondent self-reports health as being in good condition	0.831	0.375
Dependants	Number of dependants in household	0.604	1.033
Rural	=1 if respondent resides in rural/remote area	0.340	0.474
Married	=1 if respondent is married	0.491	0.500
Defacto	=1 if respondent is in a de facto relationship	0.146	0.353
Separated	=1 if respondent is separated	0.026	0.160
Divorced	=1 if respondent is divorced	0.060	0.238
Widowed	=1 if respondent is widowed	0.046	0.209
Postgraduate	=1 if respondent's highest education level achieved is masters or doctorate	0.049	0.216
Graduate diploma	=1 if respondent's highest education level achieved is graduate diploma or certificate	0.056	0.231
Bachelor	=1 if respondent's highest education level achieved is bachelor or honours	0.143	0.350
Diploma	=1 if respondent's highest education level achieved is advanced diploma or diploma	0.093	0.290
Certificate	=1 if respondent's highest education level achieved is certificate I, II, III or IV	0.209	0.406
Year 12	=1 if respondent's highest education level achieved is year 12 or below	0.152	0.359
Disabled person in household	=1 if any member of the household has any long-term health condition, disability, or impairment		
Aged person in household (65+ yrs)	=1 if any member of the household is aged 65 years and above.		
Injury/illness to relative (12 months)	=1 if respondent's close relative/family member experienced a serious injury or illness in the past year	0.153	0.360
Financial resilience	=1 if respondent is able to raise \$2000 (waves 1-8), \$3000 (waves 9-19) or \$4000 (waves 20+) within 1 week for an emergency	0.781	0.414
Social capital	Continuous variable for respondent's social capital score	11.804	9.148

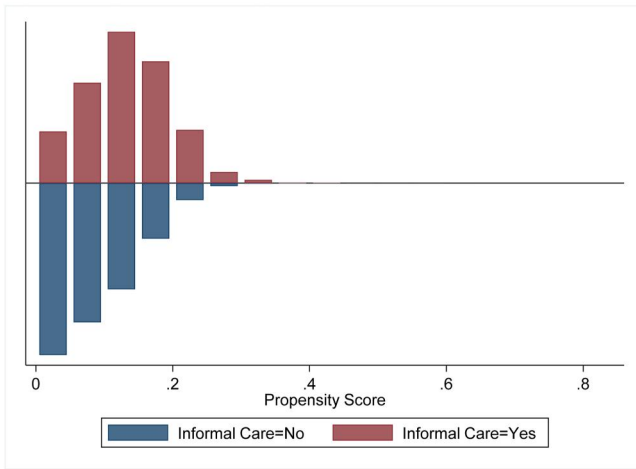


FIGURE A1 Region of common support. Source: Authors' estimates from the HILDA data.