

The relationship between regional spending on aged care and informal care supply

32ND COLLOQUIUM ON PENSIONS AND RETIREMENT RESEARCH (CEPAR, UNSW)

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Background (1)

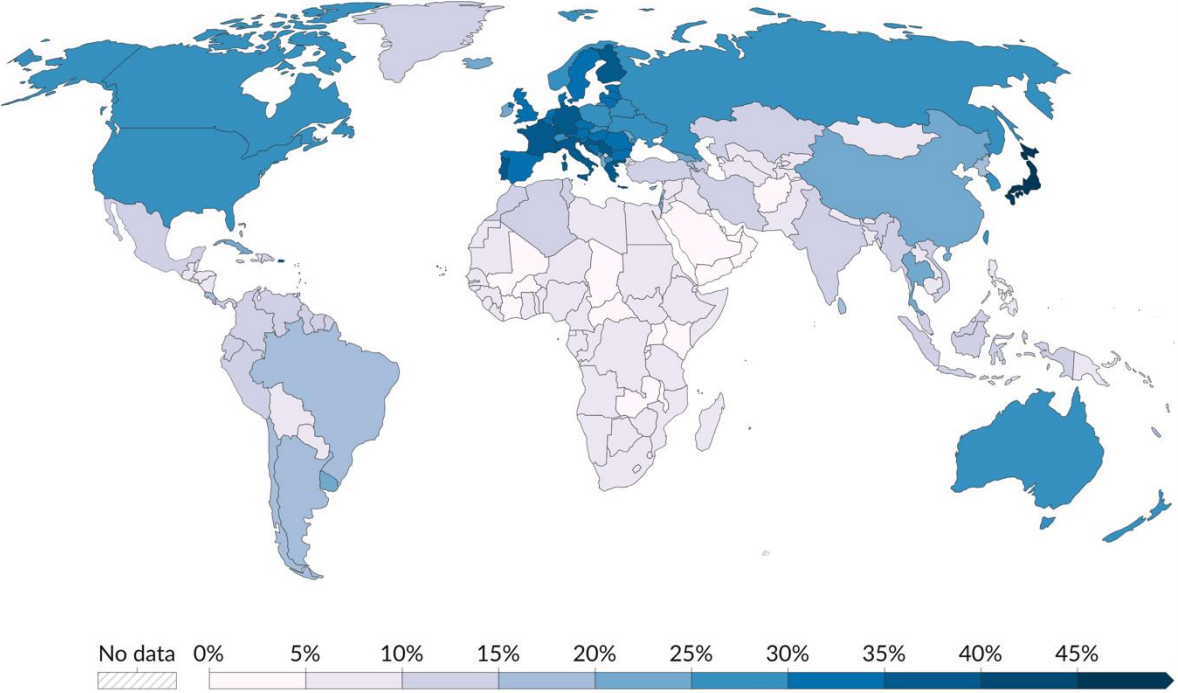
- Many countries face the enduring challenge of ensuring their health and social care systems are adequately funded to provide much-needed aged care services in the face of ageing populations and government budget constraints
 - Majority of government spending (98.6%) on aged care comes from the Australian Government (AIHW, 2024)
 - Around 84% of aged care costs (LTC) financed by government in Europe (Neubert et al 2019)
- Pressure on aged care budgets is expected to get worse as the population ages
 - This challenge will become more acute given the world population aged 80 years or older is expected to triple by 2050 (World Health Organization, 2022)
- Budgetary pressures linked to old age dependency ratios (and health-adjusted dependency ratios)
- Recent aged care reforms in Australia (increased user-pay elements)

Old-age dependency ratio (%)

PEOPLE AGED 65+ RELATIVE TO NUMBER OF WORKING AGE PEOPLE

Old-age dependency ratio, 2023

The number of elderly people (over 64 years old) relative to the number of working-age people (15-64 years). Figures are shown as the number of dependents per 100 working-age people. A value of 20% means that there are 20 people of old age for every 100 working-age people.



Data source: UN, World Population Prospects (2024)

OurWorldinData.org/age-stru

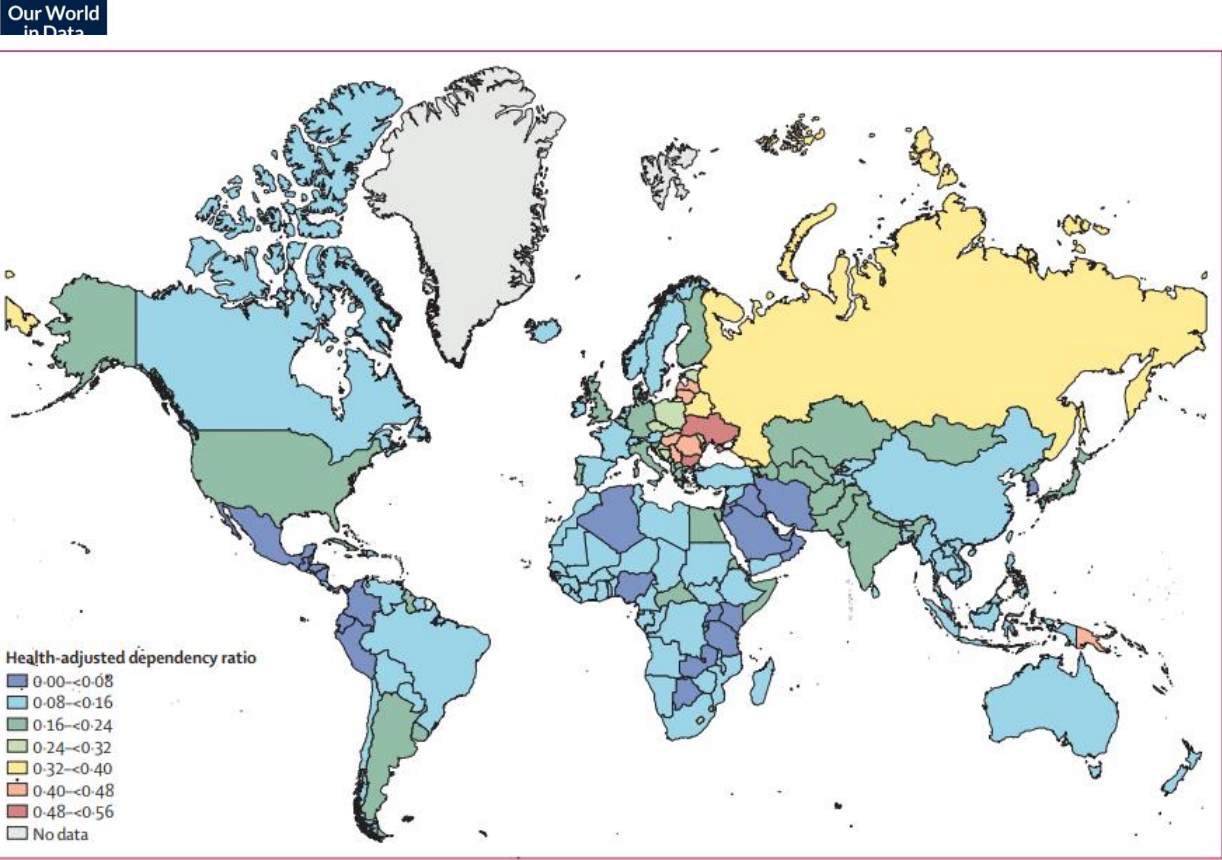


Figure 2: Health-adjusted dependency ratio by country, 2017
Higher values indicate higher ageing burden.

Skirbekk et al. (2022) *The Lancet*

Background (2)

- Older people rely on formal and informal care to meet their daily care needs:
 - Formal aged care includes paid support provided in the older person's own home or in a nursing home (DoHA)
 - Informal care is unpaid support provided within the context of an existing interpersonal relationship (AIHW).
- Informal care essential to the wellbeing of many older people yet supply projected to decline in high-income countries (smaller family sizes, increased female labour force participation, and higher retirement ages (Broese van Groenou & De Boer, 2016).
 - Reduced access to informal care, if not adequately replaced by formal aged care, may diminish the quality of life for older people.
 - Informal care provision may also affects carers by impacting labour force participation and wellbeing (Leigh, 2010; Van den Berg et al., 2014).
- In Australia, long-term shift in policy to 'ageing at home', CDC, increase in Home Care packages.
- Policy success will depend on the relationship between informal and formal care
 - If complements, more informal care required to accompany increased aged care spending
 - If substitutes, increased aged care spending may reduce informal care supply

Research question

- **Core question:** Does informal care substitute formal in-home care and nursing home care?
- We answer this by examining the relationship between formal care spending (government subsidies) and informal care provision within Australian aged care planning regions (ACPRs)
- We recognize any substitution relationship is likely to be heterogeneous, differing across:
 - skill requirements (e.g., cleaning vs nursing)
 - relationship types (e.g, children vs spouse)
 - age, gender, health status and cultural backgrounds
 - access to informal and formal care
- Little is known about moderating effect of informal carer characteristics on informal care supply responses

Existing literature

- Various results on the relationship between informal care and formal care
 - Substitutes in-home care (Bolin et al 2008, Van Houtven and Norton 2004, Zhang et al 2021) and nursing home care (Van Houtven and Norton 2004)
 - Complements in-home care (Jimenez-Martin and Prieto 2012, Lin 2019, Bonsang 2009) and nursing home care (Du 2012)
 - Substitutes and complements aged care (Courbage et al, 2020, Balia and Brau 2014)
 - Little to no substitution (Hanley et al 1991, Pezzin et al 1994, Penning 2002, McMaughan Moudouni et al 2012, Balia and Brau 2014)
- Many studies likely biased because endogeneity is poorly accommodated
 - Characteristics of the informal carer not observed
 - Measurement error from recall bias of older care recipients

Our contribution

- Our research extends the literature by:
 - Using a large dataset (obs.=216,000) collected over 13 years
 - Controlling for unobserved time-invariant individual informal carer effects
 - Exploring substitution across carer characteristics
 - Exploring substitution across informal carer circumstance (co-residing carer or living somewhere else)
- Few past studies analyse relationship between formal care and informal care from a supply-side lens
 - important research gap, given decrease in informal care supply projected for high-income countries
- We model the ‘effect’ of formal care spending on the supply of informal care
- First study estimating relationship in Australian context

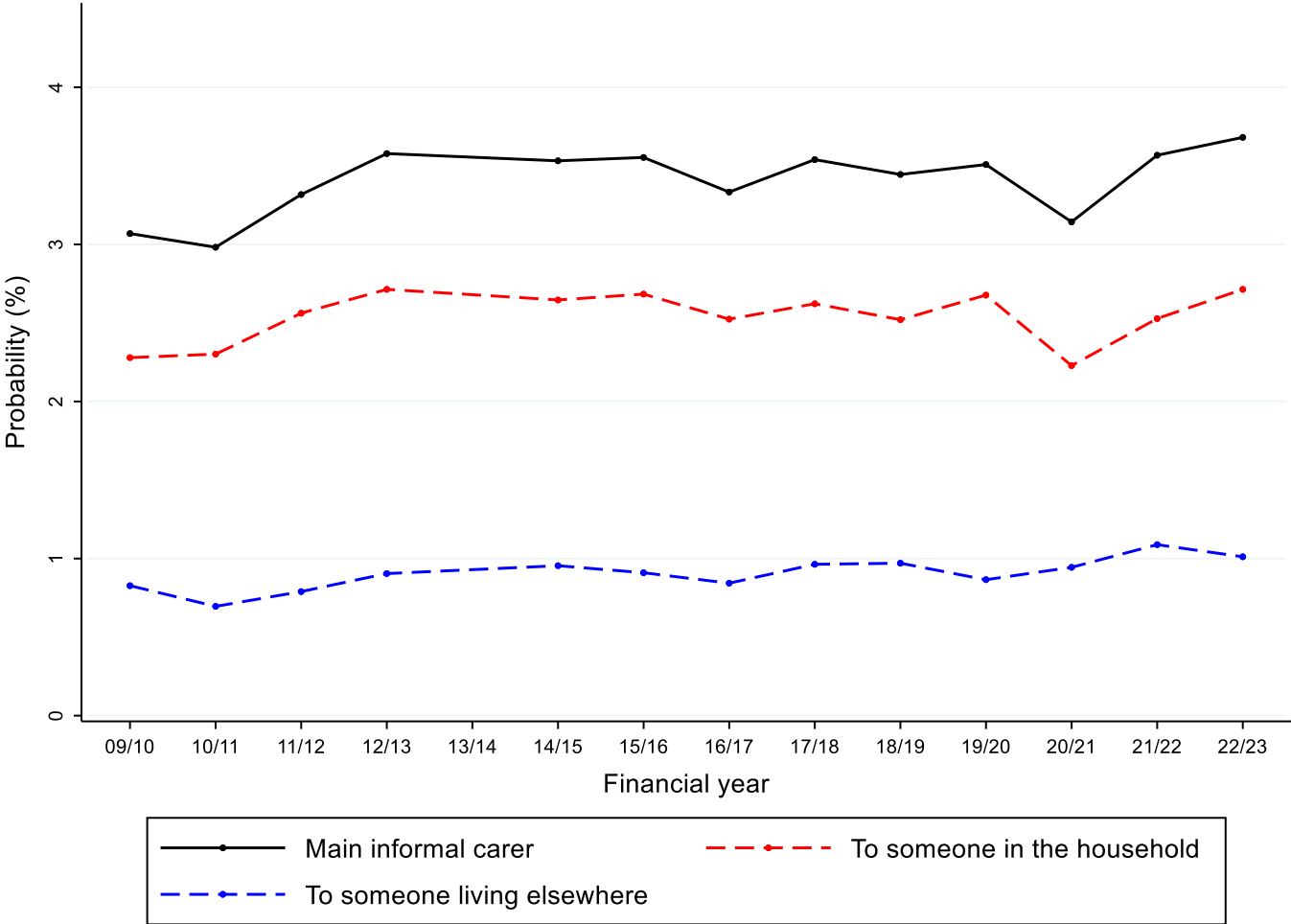
Data

- Household, Income and Labour Dynamics in Australia (HILDA) survey (Waves 9-22)
- Federal government spending on Home Care packages and nursing homes across circa 5,500 facilities (2009-2022) and 73 Aged Care Planning Regions
 - Funding is allocated based on proportion of 70+ population in region
- Mapped government aged care subsidies per person aged 70+ years across all ACPRs
 - Provided an indicator of aged care spending per person across ACPRs
- Linked aged care spending indicators to HILDA respondents (potential informal carers) by postcode
- Baseline estimation used approx. 216,000 observations from 27,000 individuals

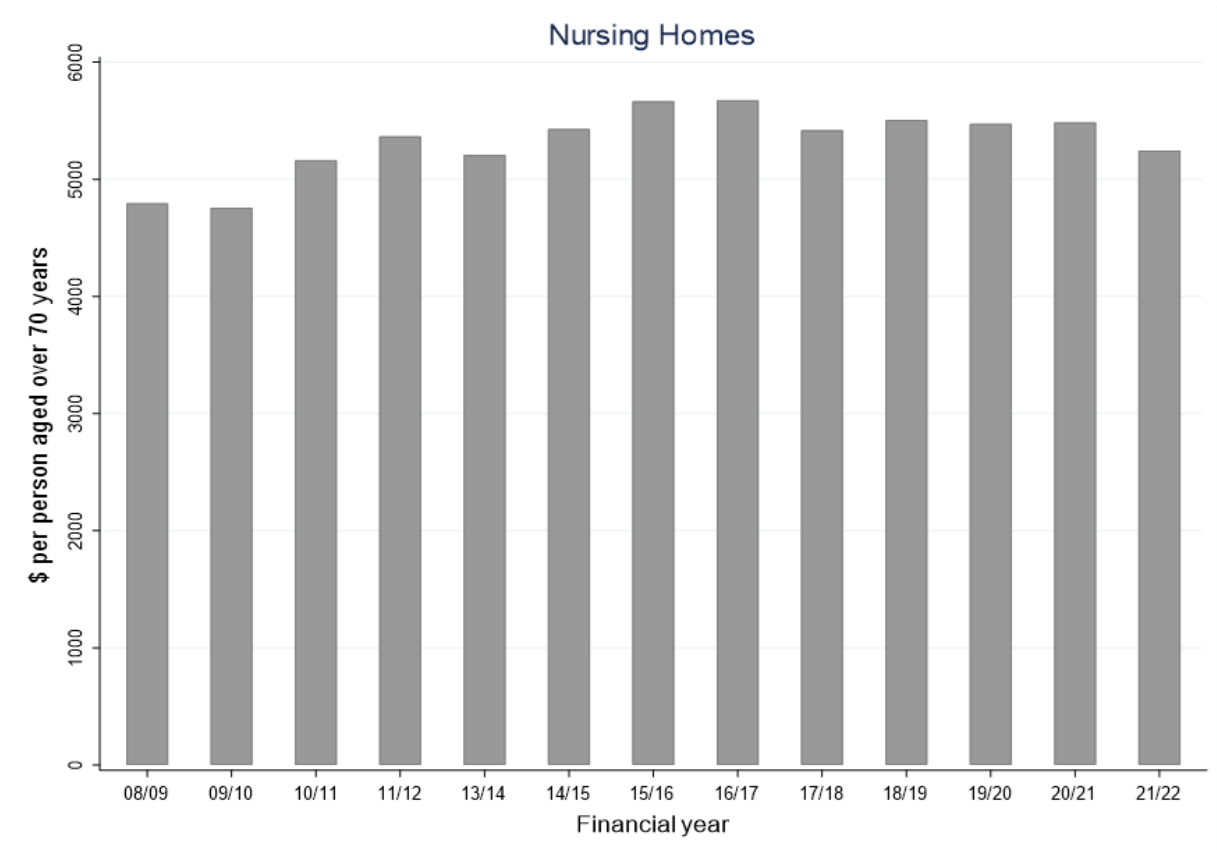
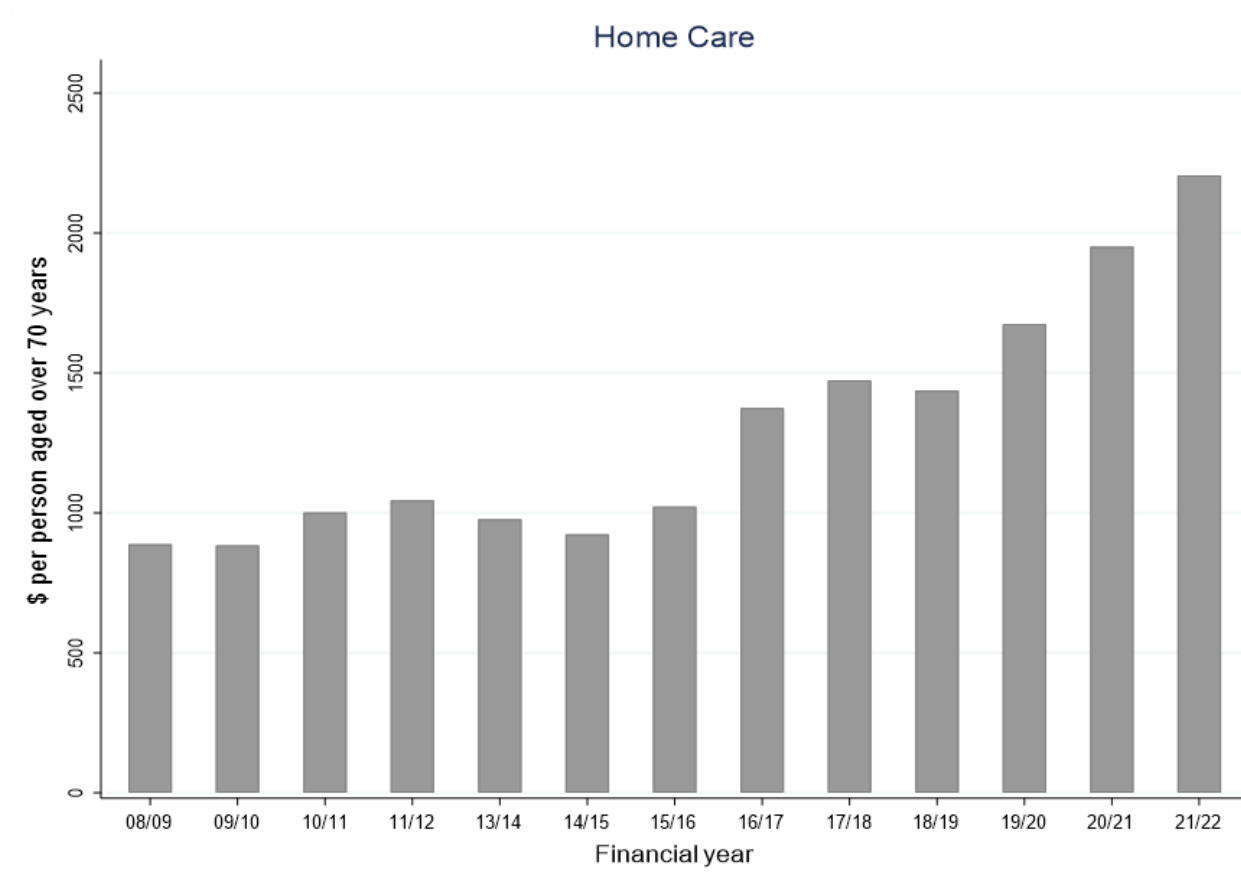
Outcome variables

- HILDA asks respondents several questions on: :
 - ‘whether there is anyone in the household or living elsewhere who has a long-term health condition, who is elderly or who has a disability’, and for whom they care for or help on an ongoing basis with self-care (bathing, eating or getting dressed), mobility, and communication’.*
- Based on these questions we constructed three binary outcome variables:
 1. Being a main informal carer
 2. Being a main informal carer to someone in the household
 3. Being a main informal carer to someone living elsewhere

Outcome variables



‘Exposure variables’ (\$ per older person in ACPR)



Covariates

Covariate	Observations (number)	Mean	Min	Max
Age (years)	216,540	45.152	15	101
Male (0/1)	216,540	0.473	0	1
In married or de facto relationship (0/1)	216,540	0.585	0	1
Household size (counts)	216,540	2.779	1	14
Highest educational attainment:				
High school or less (0/1)	216,540	0.427	0	1
Certificate or diploma (0/1)	216,540	0.317	0	1
Tertiary degree (0/1)	216,540	0.257	0	1
Area remoteness:				
Major city (0/1)	216,540	0.657	0	1
Regional area (0/1)	216,540	0.328	0	1
Remote area (0/1)	216,540	0.015	0	1
Health condition and dependent children:				
Has long-term health condition (0/1)	216,467	0.291	0	1
Has dependent children aged 0-4 (0/1)	216,540	0.132	0	1
Has dependent children aged 5-14 (0/1)	216,540	0.184	0	1
Labour force status:				
Employed full time (0/1)	216,236	0.421	0	1
Employed part time (0/1)	216,236	0.213	0	1
Unemployed and looking for full-time work (0/1)	216,236	0.026	0	1
Unemployed and looking for part-time work (0/1)	216,236	0.014	0	1
Not in the labour force but marginally attached (0/1)	216,236	0.061	0	1
Not in the labour force and not marginally attached (0/1)	216,236	0.267	0	1
Other constraints on informal care:				
Individual non-wage income in prior year (\$)	216,540	23,234	0	7,647,777
Hourly wages (actual or imputed) (\$)	215,972	24.718	0	3,332
Homeowner (0/1)	216,540	0.668	0	1
Unemployment rate for major statistical region (%)	216,540	5.251	2.3	8.0

Estimation strategy

- Individual level fixed-effect estimation

$$Y_{it} = \beta_0 + \beta_1 \text{homespend}_{it} + \beta_2 \text{residentialspend}_{it} + \beta_n X_{it} + \eta_i + u_{it} \dots\dots\dots (1)$$

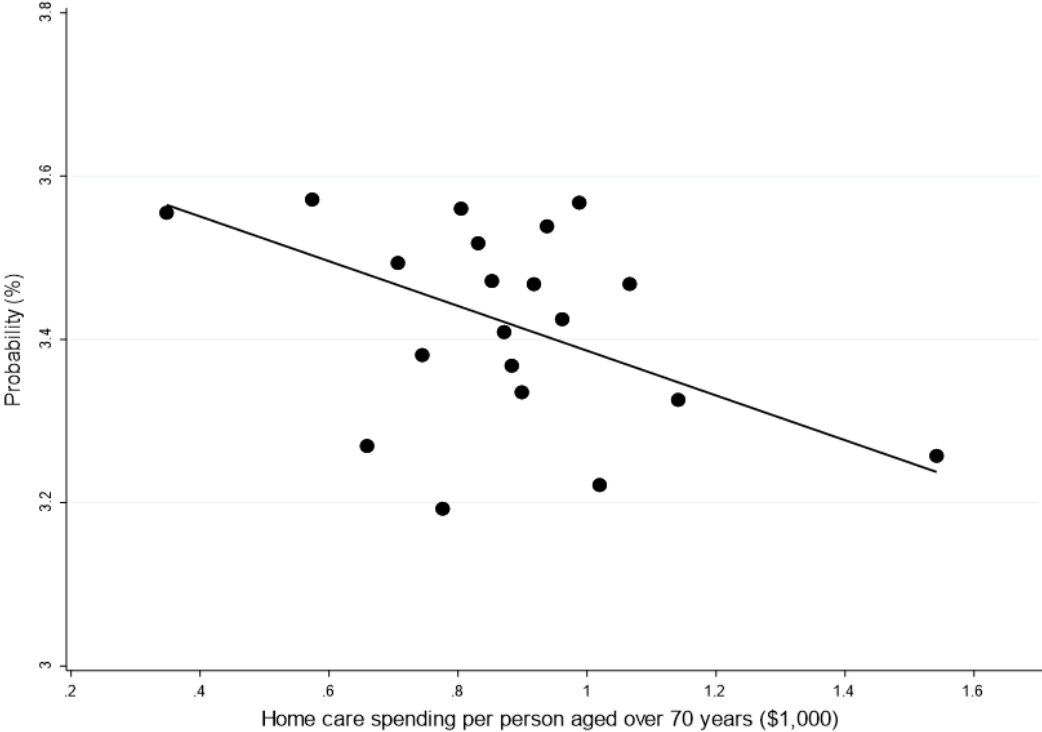
- Substitution exists if $\beta_1, \beta_2 < 0$
- Employed bounding approach to test robustness to unobserved confounders (Oster 2019, Bryan et al 2022)
 - Proposes an estimator for omitted variable bias that relies on observed variance and shares of variance explained by controls
 - Uses coefficient movements and R-squared movements to estimate bias
 - The estimated effects are interpreted as being robust if the bounded set of effect estimates excludes zero

Additional analyses

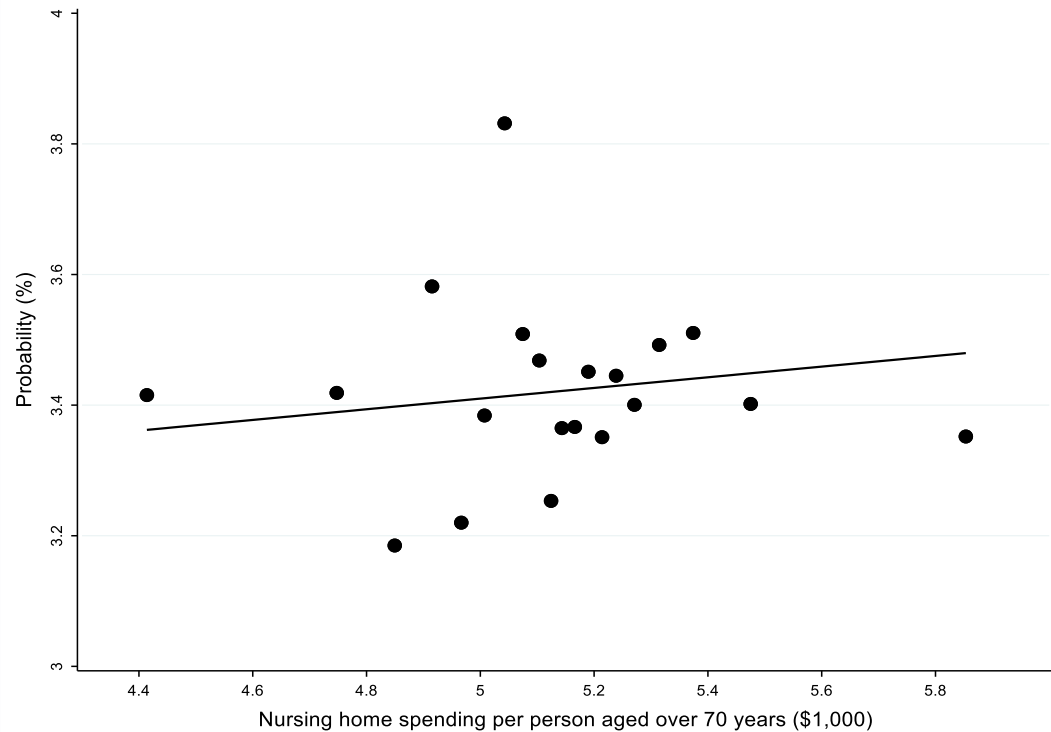
- Employed an IV approach using lagged spending on formal aged care as an instrument of current year spending (Zigante et al 2021)
 - Consistent and less biased than OLS if exclusion restriction is satisfied (Wang and Bellemare 2019)
- Employed approach that uses heteroscedasticity to estimate models with potential endogenous regressors where IVs are unavailable (Lewbel et al 2012)
 - Exploits moments and distributional properties of the error terms
- Dropped outliers associated with Northern Territory ‘extremes’ in spending
- Conducted estimations for a sample of ‘non-mover’ individuals, who stayed in the same ACPR over the study period
- Explored heterogeneity in substitution rates across aged care subsidy type and informal carer characteristics through interaction terms with β_1 and β_2

Baseline results (binned scatter plots)

A1: Home care spending and main informal care



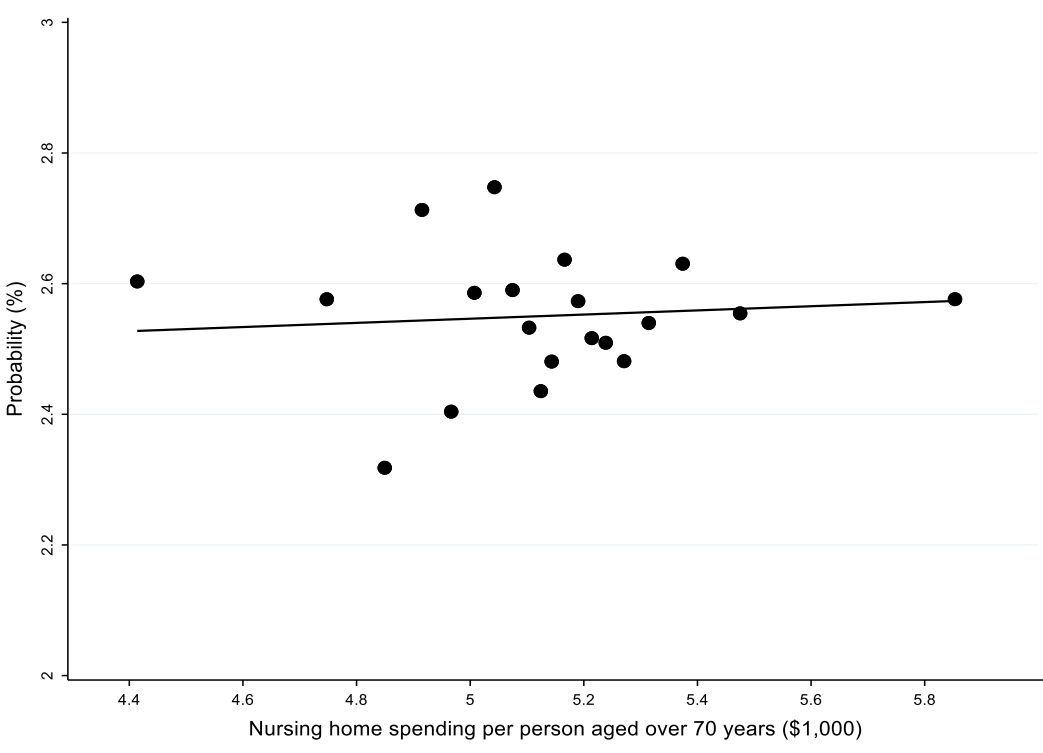
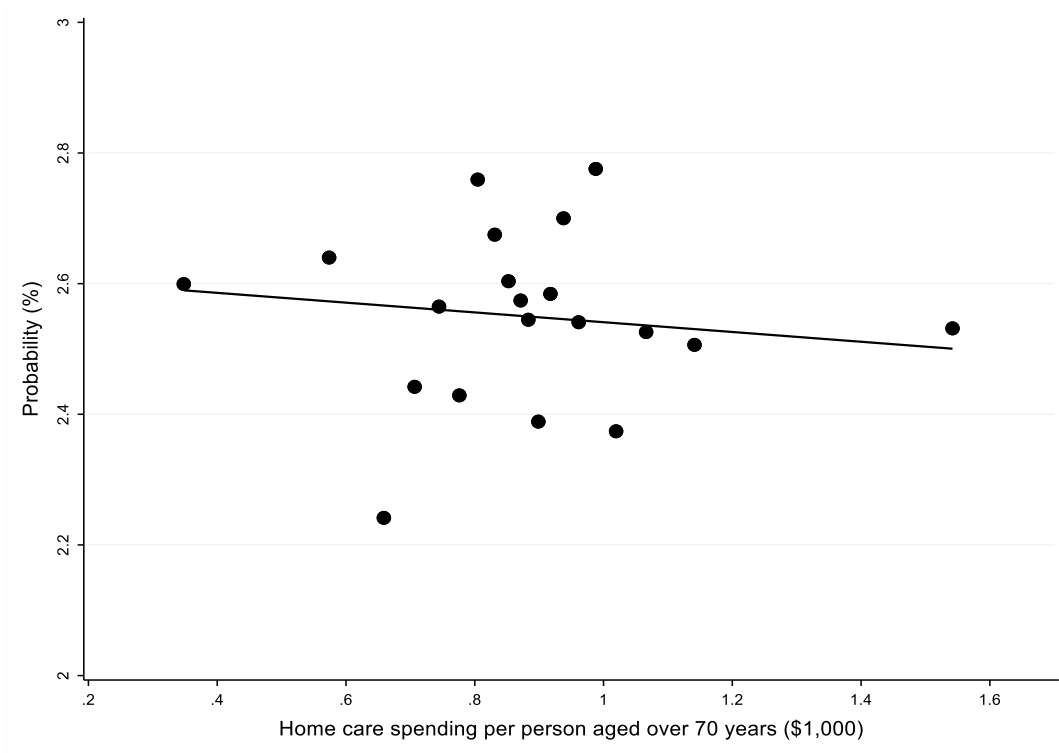
A2: Nursing home spending and main informal care



Baseline results (binned scatter plots)

B1: Home care spending and intra-household care

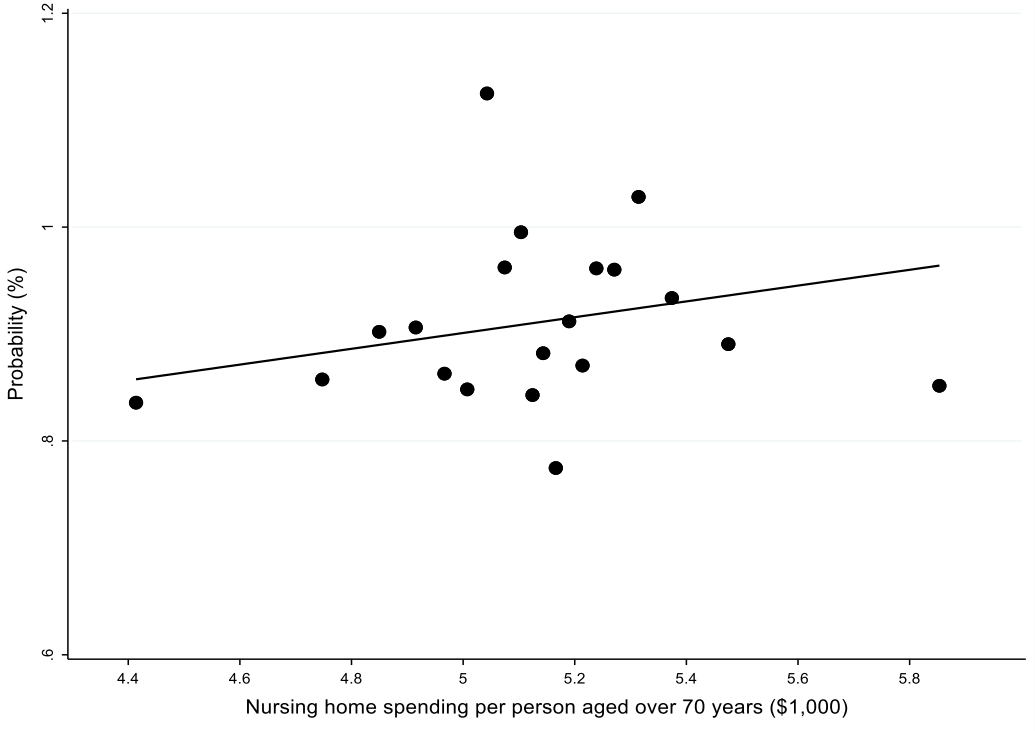
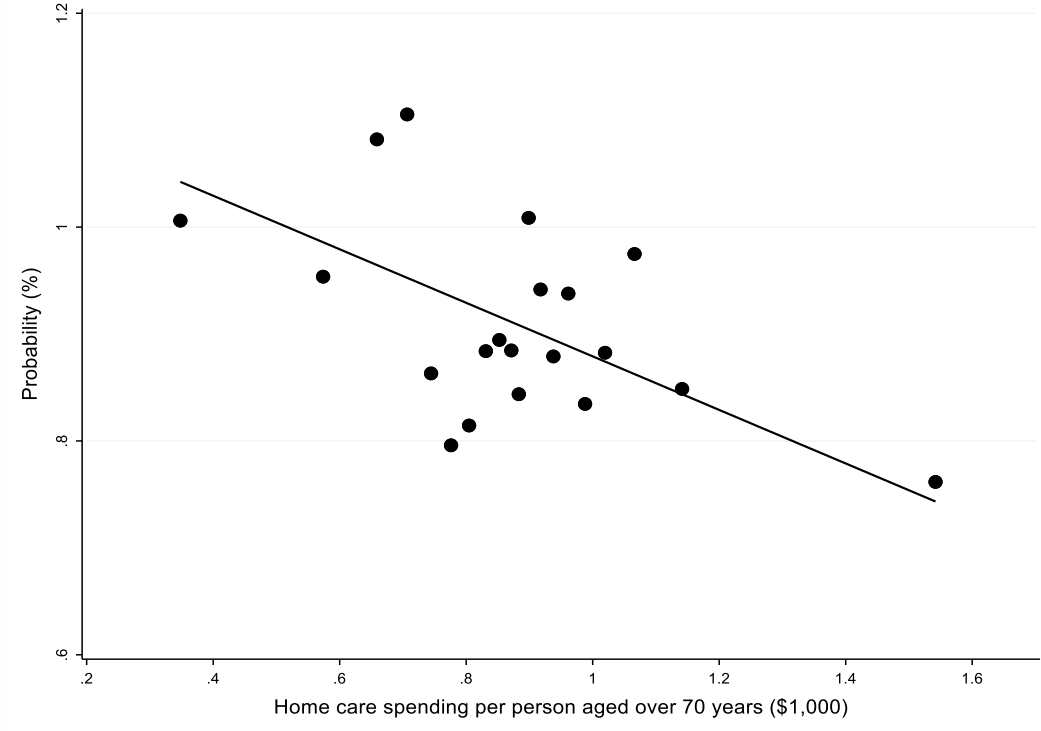
B2: Nursing home spending and intra-household care



Baseline results (binned scatter plots)

C1: Home care spending and extra-residential care

C2: Nursing home spending and extra-residential care



Baseline results: % change in probability of informal caring for \$1,000 aged care spending per older person

	[1] FE	[2] FE - Oster bounds		
		$\delta = 1$	$\delta = 1.5$	$\delta = 2$
(A) Estimated effect on probability of being main informal carer				
Spending – home care	-0.2740 (0.1564) *	-0.2671	-0.2634	-0.2596
Spending – nursing homes	0.0817 (0.1320)	0.1049	0.1172	0.1299
Observations (individuals)		215,899 (27,711)		
(B) Estimated effect on probability of being main informal carer to someone in the household				
Spending – home care	-0.0749 (0.1215)	-0.0661	-0.0614	-0.0566
Spending – nursing homes	0.0319 (0.1146)	0.0437	0.0499	0.0564
Observations (individuals)		215,899 (27,711)		
(C) Estimated effect on probability of being main informal carer to someone living elsewhere				
Spending – home care	-0.2504 (0.1116) **	-0.2467	-0.2447	-0.2426
Spending – nursing homes	0.0739 (0.0713)	0.0916	0.1011	0.1113
Observations (individuals)		215,899 (27,711)		

Results: heterogeneity

	<i>Home care Spending</i>	<i>Nursing home spending</i>
<i>(C) Estimated effect on probability of being main informal carer to someone living elsewhere</i>		
Age		
15-24	-0.0530 (0.0692)	0.1311 (0.0658) **
25-34	-0.0827 (0.0752)	0.0032 (0.0749)
35-44	-0.0730 (0.1161)	0.0524 (0.1162)
45-54	-0.1539 (0.2288)	0.0642 (0.1399)
55-64	-0.3615 (0.2522)	0.2399 (0.1983)
65-74	-0.7789 (0.2142) ***	-0.1357 (0.1985)
75+	-0.4577 (0.1154) ***	-0.0660 (0.1252)
Gender		
Male	-0.2019 (0.0950) **	0.0706 (0.0715)
Female	-0.2906 (0.1497) *	0.0758 (0.1001)
Full-time job status		
Not in full-time employment	-0.4055 (0.1409) ***	0.0320 (0.0920)
In full-time employment	-0.0937 (0.0925)	0.1082 (0.0692)
Presence of dependent children		
No dependent children	-0.3699 (0.1296) ***	0.0697 (0.0773)
Dependent children	0.0280 (0.0928)	0.1208 (0.0939)

	<i>Home care Spending</i>	<i>Nursing home spending</i>
<i>(C) Estimated effect on probability of being main informal carer to someone living elsewhere</i>		
Cultural background		
Not from CALD background	-0.2372 (0.1164) **	0.1169 (0.0743)
From CALD background	-0.3949 (0.1462) ***	-0.2996 (0.1457) **
Oldest person in household		
Aged 80 years or older	-0.4268 (0.1702) **	-0.2132 (0.1477)
Aged less than 80 years	-0.2391 (0.1144) **	0.0852 (0.0728)
Remoteness		
Major city	-0.1768 (0.1006) *	-0.0625 (0.0953)
Regional or remote areas	-0.3886 (0.1767) **	0.2170 (0.0930) **
Consumer-directed funding		
Before 2017 policy change	-0.2394 (0.1474)	0.0868 (0.0739)
After 2017 policy change	-0.2451 (0.1152) **	0.0482 (0.0999)

Note: Each panel reports results from a separate regression with interaction terms.

Additional analyses results

- **IV checks:** Sign and significance of the IV estimated effects generally align with the baseline effects. In some cases, the IV-estimated effects for the substitution between in-home care and being a main informal carer (including extra-residential carer) larger in magnitude than the baseline
- **Non-movers analysis:** While the sample size is substantially reduced, the results, including the significance and strength of the substitutive relationship informal care and in-home care spending, remain robust.
- **Northern Territory ACPRs exclusion:** reduced size and significance of estimated effects
 - Limited availability of aged care across these ACPRs, and the limited ability to substitute between ‘home care’ and ‘nursing home care’ (due to the lack of nursing homes), it is likely that there is a greater marginal benefit attached to home care spending, in terms of the substitution effect with informal care.

Discussion

- We find informal care substitutes in-home care (particularly when carer lives away from care recipient) but not nursing home care
- Results suggests Home Care funding increase between 2015-16 and 2021-22 likely reduced informal care
- Substitution between informal care and Home Care increases for carers:
 - Aged 65 years or older
 - Not in full time employment
 - Who have no dependent children
 - From a Culturally and Linguistically Diverse background
 - Live in a regional or remote location
- Results show greater and more significant substitution effects between in-home care spending and informal care in the years after the 2017 consumer-directed funding policy
 - Potentially greater ability for carers and care recipients to effectively use home care funding to tailor their care package and reduce need for informal care following the 2017 reform)?

Discussion

- Our study is the first to empirically explore the relationship between regional formal care spending and informal care supply in Australian aged care, and one of the few to analyse this relationship from a supply-side lens looking at informal care provision.
- Results suggest that the policy shift towards home care is likely to reduce informal care supply and particularly so within older informal carers and those not in the labour force.
 - The substitution effect we find suggests that increased home care provision may limit the amount of total care (informal and home care) received by the older, community-dwelling population.
 - Uncertain how reduced informal care supply affects quality and adequacy of total care received by older Australians, does it affect propensity of entering nursing home care due to declining health?
- Results suggest that consumer-directed care reforms may have increased the ability of recipients (and carers) to effectively use home care funding to reduce the need for informal care.
- Increased Home Care funding may have benefited informal carers the most (health outcomes)



The End

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Institutional setting

- Aged care receives over \$20 billion in government subsidies each year
- Four levels of Home Care packages offered to those ‘in need’
 - Level 1 for domestic help, Level 4 for people with dementia living at home
- Nursing home care offered to those ‘in need’
 - Around 40% are supported residents, who have their care and accommodation costs paid for by the government
 - The remainder make some copayment based on their assets and income
- Home Care packages and nursing home places are allocated by government based on ratios within 73 Aged Care Planning Regions

Table 1: Instrumental variable estimation: effect (per cent change in probability) of \$1,000 increase in Commonwealth aged care spending per person aged 70+ in ACPR on informal caring

	<i>[1] FE</i>	<i>[2] FE- lagged spending IV</i>	<i>[3] FE – heteroskedast. IV</i>	<i>[4] FE – Both lagged spending and heterosk. IV</i>
(A) Estimated effect on probability of being main informal carer				
Spending - home care	-0.2386 (0.1392) *	-0.3801 (0.1837) **	-0.2472 (0.1814)	-0.3331 (0.1687) **
Spending – nursing home care	0.1012 (0.1356)	0.0977 (0.1575)	0.1338 (0.2252)	0.0928 (0.1552)
First-stage F-statistic		1,822	132.8	1,721
Hansen J statistic			63.54	63.63
Hansen J p-value			0.631	0.691
<i>Observations (individuals)</i>	185,188 (26,832)	185,188 (26,832)	185,188 (26,832)	185,188 (26,832)
(B) Estimated effect on probability of being main informal carer to someone in the household				
Spending - home care	-0.0353 (0.1129)	-0.1290 (0.1449)	-0.0652 (0.1525)	-0.1041 (0.1331)
Spending – nursing home care	0.0579 (0.1197)	0.0455 (0.1384)	0.0941 (0.1971)	0.0473 (0.1364)
First-stage F-statistic		1,822	132.8	1,721
Hansen J statistic			63.99	63.91
Hansen J p-value			0.615	0.682
<i>Observations (individuals)</i>	185,188 (26,832)	185,188 (26,832)	185,188 (26,832)	185,188 (26,832)
(C) Estimated effect on probability of being main informal carer to someone living elsewhere				
Spending - home care	-0.2151 (0.0867) **	-0.2590 (0.1202) **	-0.1925 (0.1007) *	-0.2381 (0.1094) **
Spending – nursing home care	0.0486 (0.0707)	0.0528 (0.0827)	0.0319 (0.1142)	0.0454 (0.0813)
First-stage F-statistic		1,822	132.8	1,721
Hansen J statistic			57.65	58.02
Hansen J p-value			0.810	0.846
<i>Observations (individuals)</i>	185,188 (26,832)	185,188 (26,832)	185,188 (26,832)	185,188 (26,832)

Note: Baseline FE specification was re-estimated since using lagged spending as IV resulted in missing values.

Table 1: Estimated effect of \$1,000 increase in Commonwealth aged care spending per person aged 70+ in ACPR on informal caring (excluding NT 'outlier' regions)

	[1] FE	[2] FE - Oster bounds		
		$\delta = 1$	$\delta = 1.5$	$\delta = 2$
(A) Estimated effect on probability of being main informal carer				
Spending – home care	-0.2273 (0.1587)	-0.2316	-0.2338	-0.2360
Spending – nursing homes	0.0364 (0.1426)	0.0530	0.0618	0.0710
Observations (individuals)		215,474 (27,673)		
(B) Estimated effect on probability of being main informal carer to someone in the household				
Spending – home care	-0.0395 (0.1375)	-0.0403	-0.0406	-0.0410
Spending – nursing homes	0.0100 (0.1255)	0.0168	0.0203	0.0240
Observations (individuals)		215,474 (27,673)		
(C) Estimated effect on probability of being main informal carer to someone living elsewhere				
Spending – home care	-0.1918 (0.0859) **	-0.1963	-0.1987	-0.2010
Spending – nursing homes	0.0453 (0.0736)	0.0573	0.0637	0.0706
Observations (individuals)		215,474 (27,673)		

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

Table 1: Estimated effect of \$1,000 increase in Commonwealth aged care spending per person aged 70+ in ACPR on informal caring for non-movers

	[1] FE	[2] FE - Oster bounds		
		$\delta = 1$	$\delta = 1.5$	$\delta = 2$
(A) Estimated effect on probability of being main informal carer				
Spending – home care	-0.4437 (0.2264) *	-0.4520	-0.4562	-0.4604
Spending – nursing homes	0.0143 (0.2494)	0.0109	0.0093	0.0076
Observations (individuals)		147,869 (20,554)		
(B) Estimated effect on probability of being main informal carer to someone in the household				
Spending – home care	-0.1766 (0.1940)	-0.1823	-0.1852	-0.1881
Spending – nursing homes	-0.0141 (0.2099)	-0.0213	-0.0249	-0.0285
Observations (individuals)		147,869 (20,554)		
(C) Estimated effect on probability of being main informal carer to someone living elsewhere				
Spending – home care	-0.2645 (0.1254) **	-0.2677	-0.2693	-0.2709
Spending – nursing homes	0.0583 (0.1371)	0.0632	0.0656	0.0681
Observations (individuals)		147,869 (20,554)		

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