

The Impact of the Provision of Informal Care on Labour Force Participation Behaviour

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Abstract: With an ageing population and an increasing incidence of disability, the demand for informal care is increasing when the Federal Government is trying to raise labour force participation. In 2003 16% of the adult population provided informal care. However, 'Caregiving and receiving is a relationship, providing worth and value to all participants' (Cass, 2006), so that public policy designed to support caring should not view it merely as a marketable service if not available informally.

In this paper, we employ econometric techniques to explore the impact of different specifications of informal care on labour force participation behaviour. The paper then focuses on the interdependence of participation behaviour and the provision of informal co-residential care and how these decisions are conditioned by socio-economic factors. Finally the implications of the results for the (re)design of public policy are explored.

1. Introduction

Australia and other Western countries face the challenge of providing adequate care for their citizens with disabilities and long term health problems in the context of an ageing population. A carer is 'a person of any age who provides any informal assistance, in terms of help or supervision, to persons with disabilities or long-term conditions, or older persons (i.e. aged 60 years and over)' (ABS, 2003). This assistance is defined as likely to be ongoing at least six months. When the care recipient and carer are co-residents, the assistance is for one or more of the following activities: (i) cognition or emotion; (ii) communication; (iii) health care; (iv) housework; (v) meal preparation; (vi) mobility; (vii) paperwork; (viii) property maintenance; (ix) self care; (x) transport (ABS, 2003, p.71). In 1998, 15.6% of the population was acting as an informal carer, either in a primary or minor role, and this figure increased to 16.2% in 2003. Over the same period the rate of disability in Australia increased from 19.3% to 20.0% (ABS, 2003).

A primary carer provides most of the informal assistance, in the form of help or supervision, to a person with one or more disabilities. The assistance is provided for one or more of the core activities (communication, mobility and self care) (ABS, 2003, p.77).

There is a tendency in the literature to commodify the provision of care, rather than recognising its location within a normative framework of obligations and responsibility (Daly and Lewis, 2000, quoted in Cass, 2006). Consequently the policy dilemma is conceptualised in terms of the costs and benefits of different combinations of public and private care subject to perceived funding constraints.

Of over 3.5 million elderly and disabled individuals needing assistance in 2003, 177,000 individuals received no assistance. Informal carers provided some assistance to nearly 2 million individuals, whereas formal care was provided to between 1.3 and 1.4 million individuals.

Primary carers provided assistance to 474,600 individuals in 2003, with over 90% being immediate family members that is a partner, parent or child. 371,200 recipients of informal care were co-resident with their primary carers. Over 70% of primary carers and about 56% of all carers were women. Estimates of the cost of providing informal care range from \$4.9b under the opportunity cost model to \$30.5b if these services were provided through formal care (Access Economics, 2005). Thus informal carers play a significant role in supporting their disabled and elderly relatives and friends.

48.4% of primary carers provided 40 or more hours of assistance. Primary carers had a labour force participation rate of 39% in 2003 compared to all carers (56.1%) and non-carers (67.9%) (ABS, 2003). The median gross personal income per week was \$237 for primary carers, \$300 for all carers and \$407 for non-carers. Thus career prospects, leisure time, income, and pension entitlements may well be sacrificed by combining paid work and informal caring (Carmichael and Charles, 2003, and Heitmueller and Inglis 2004).

Demographic as well as economic and social trends are likely to impose increased pressure on the provision of care. Life expectancy has continued to rise and there is an increased desire on the part of the elderly to remain in their own homes, but changing family patterns with lower marriage rates, fewer children, greater geographic mobility, the rising labour force participation of women who are typically the primary carers and declining intergenerational co-residence will impact on informal care patterns over time (Heitmueller, 2004, p.4). Unless informal carers have the capacity to negotiate 'family friendly' workplace arrangements, it will be difficult to combine informal care with paid employment, particularly if the disabled and/or aged have significant care needs which cannot be partially met by formal care. Informal carers may well be forced to reduce hours of work and some may have to leave the labour market. Thus, despite the caution associated with viewing the provision of care in purely economic terms, dignity and continued independence in old age may well be increasingly reliant on a comprehensive and affordable system of formal care to complement the provision of informal care.

This paper will use the ABS *Confidentialised Unit Record File, Survey of Disability, Ageing and Carers*, 2003 and employ probit estimation techniques to analyse the relationship between informal care responsibilities and labour market participation by gender and age. The impact of different specifications of informal care on labour force participation behaviour will be examined. The paper then focuses on the interdependence of participation behaviour and the provision of informal co-residential care and how these decisions are conditioned by socio-economic factors. Finally the implications of the results for the (re)design of public policy are explored.

2. Literature review

The theoretical literature on the incidence and allocation of informal care is limited with most models being based on intra-household decision making with respect to the care of elderly parents by their children (see, for example, Stern, 1995 and Wolf and Soldo, 1994). Two points need to be made here. First a demand for informal care arising from a close relative or friend may or may not be reciprocated, which may result from some form of estrangement, but equally could be a consequence of the difficulty of access. A solution may be for carer(s) and the dependent to co-reside, but this may be impractical due to financial considerations and/or limited space in the

family residence. In later empirical work we focus on the demand for co-residential informal care, but we cannot model the behaviour underpinning the decision to co-reside or the specific sharing of informal caring responsibilities within a household.

The orthodox analysis of the allocation informal caring is underpinned by a utility maximisation framework. First the availability and cost of formal care and the extent to which it is substitutable for informal care will influence the demand for informal care. Second, the leisure work trade off is made additionally complicated by informal caring which also consumes time and has the same opportunity cost as leisure (Heitmueller and Michaud, 2006, p.5).

The impact of caring on employment and leisure can be broken down into substitution and income effects, which will be affected by whether leisure and informal care are substitutes or complements. With time being scarce, caring responsibilities will increase the reservation wage and reduce labour supply (substitution effect). Conversely, the extra expenditures associated with the caring commitment may induce extra paid work through an income effect. If leisure and care are substitutes, then hours of leisure will decline. In the presence of a respite effect, leisure and caring could be complements, and the income effect may be dominated leading to increased leisure (Heitmueller and Michaud, 2006, p.5, Carmichael and Charles, 2003, p.788).

The orthodox approach is limited, given its inability to distinguish between the informal carer reducing hours of paid work and ceasing to participate in the labour market. Unfortunately inadequate income data does not permit the inclusion of a wage variable in the equation to be estimated. Also the interpretation of empirical results in the context of this theoretical framework can easily lapse into tautology, in that, say a greater preparedness of women to devote time to primary care and not undertake paid work, despite particular educational qualifications, can be attributed to a recognition of the strong mutual benefits of informal care, as expressed in the underlying preferences.

The summary statistics reveal that women are the main providers of care. The rational household division of labour taking account of the respective opportunity costs of paid care, informal care and paid work in the presence of care needs *may* justify women assuming the main caring role. On the other hand, a more plausible framework, which is employed in this paper, is that women are predisposed to be caregivers and men to be breadwinners, given longstanding societal views on the respective roles of women and men in caring and paid work, with the former, in particular, recognising the reciprocal benefits of providing care. This means that there are likely to be systematic differences in the estimated participation equations for women and men.

The international evidence about the impact of caring on participation is mixed. US studies by Wolf and Soldo (1994) and Stern (1995) find no impact of parental care on either participation or conditional hours of work, whereas analysing two years of the European Community Household Panel for 12 countries, Viitanen (2005) finds that caring for the elderly just impacts significantly on hours of work. On the other hand, caring for parents living both inside and outside the household is found to have a significant impact on both female and male labour supply by Ettner (1996) and Johnson and Lo Sasso (2000). The latter authors support Cass' claim (2006) that formal care is not an attractive substitute for informal care. Carmichael and Charles (1998) find that those caring for more than 20 hours a week have lower participation rates than non-carers but individuals providing less informal care are more likely to work compared to non-carers, but supply fewer hours.

Arber and Ginn (1995, p.452) find that most informal caring is extra-residential, which is in contrast to the Australian experience. They find that provision of co-resident care causes significantly lower odds of employment for both men and women, but for extra-residential caring, there is a less systematic change in the odds ratios. There is no evidence that women are cushioned from the burden of informal caring by the capacity to take up part-time employment. Hoerger, Picone and Sloan (1996) find that the likelihood of co-resident caring increases with parental housing wealth but decreases with the care-giving burden. This is a surprising result since co-residence may be chosen to facilitate round the clock care.

Carmichael and Charles (2003) find that female carers are more likely to be the main carer and to report longer hours of care. Male carers experience a larger relative wage penalty than female carers, but still earn more on average than their female counterparts (Carmichael and Charles, 2003, pp.787-788). Men do not willingly forego paid employment, even when caring for individuals who are highly dependent. They conclude that these carers would benefit from policies which led to the provision of respite care, carer-friendly employment practices and additional non-means tested financial support.

Heitmueller (2004) notes that an individual may have the incentive to take up informal caring responsibilities to bridge spells of job search or unemployment or if inadequate skills preclude job access, due to a range of factors, including prior caring responsibilities, illness or parental care. He adopts an instrumental variable approach to overcome the biased and inconsistent estimates resulting from the caring decision being endogenous with respect to the participation decision, as a consequence of being correlated with unobservables in the participation equation. The impact of care on labour force participation increases significantly, when IV 2SLS and IV probit estimates are compared to the OLS and (single equation) probit estimates. Heitmueller (2004, p.10) finds that participation is reduced by 15% due to co-residential caring but the instruments are insignificant, and there is no indication of the endogeneity of the caring decision. On the other hand, there is some evidence of endogeneity when extra-residential care is considered, but the caring variable is insignificant. When both forms of care are included, the significance of co-residential care is confirmed in single equation specifications, but not when IV estimation is employed. Also there is some indication of endogeneity at the 10% level. However for the IV probit models no over-identification tests are employed to check whether the instruments are valid. The exogeneity of the care variable is confirmed when the variable is confined to care in excess of 20 hours per week. Heitmueller (2004, p.11) concludes that the presence of endogeneity indicates some freedom of choice in the caring decision, particularly extra-residential care.

Heitmueller (2004, pp.11-12) notes that if the need to provide care impacts exogenously on the participation decision, then more flexible working arrangements and/or more financial support to access formal care will assist informal carers to participate in the labour market. However, after an initial spell of care, carers' re-employment prospects are often significantly reduced because studies have shown that they often take on new caring responsibilities. On the other hand, if the caring decision is endogenous, reflecting, for example, lack of job opportunities or employability, then measures to improve the carer's access to job opportunities are necessary.

Heitmueller and Inglis (2004) estimate separate participation equations for carers and non-carers using panel data. Decomposing the gap of up to 8% in participation rates, the greater part is shown to be due to unfavourable institutional arrangements, such as a lack of flexible working

hours for informal carers, rather than differences in observable characteristics. Also employment re-entry probabilities for carers are significantly below those of their non-caring counterparts.

Heitmueller (2004) reports that qualitative studies have shown that many individuals providing care in their own home or for long hours perceive that they have little choice in becoming a carer (Mooney, Statham and Simon, 2002, Lankshear, Giarchi and Cox, 2000, Lewis, Kagan, Heaton and Cranshaw, 1999).

3. The dataset

The SDAC 2003 CURF is based on a survey of 49,843 respondents. The sample was reduced to 24,033 by the removal of those respondents aged under 15 and 65 years and over and those persons not resident in households. Table 1 reveals that a higher percentage of women than men are involved in caring in general (0.174 v 0.134) and acting in a primary care capacity (0.042 v 0.014).

The capacity of a co-residential carer to participate in the labour market may well depend on the presence of other adults in the household who can share the caring responsibilities. Consequently a variable representing the number of adults in each household minus one was constructed (*nhnad*). It would be expected to impact positively on the participation decision, although it may also be linked directly to participation behaviour by members of the household, reflecting whether the variable is indicative of the income needs of the household or the capacity to meet those needs via participation and paid work.

A matlab program was written to identify the number of children aged 0-4 years (*a04*), 5 -9 years (*a59*) and 10-14 years (*a1014*) and the incidence of different levels of disability, as defined above, in each household. Also household level variables based on whether a dependent in need of assistance can care for her/himself at home without difficulty for a number of days, a day or some hours. These household based variables were respecified using the household and person identifiers to generate an observation for each person.

The 'demand' for care facing an adult member of each household (15-64 years), who is a potential carer, can be defined as the total incidence of disability within the household across the seven categories, net of any limitations or restrictions experienced by the particular adult (see also Heitmueller, 2004, p.8). These net demands were identified by the prefix *nh* (net household) replacing *s* (self) yielding, for example, profound (*nhprof*). Likewise the net capacity for self-care in the household is also measured by the variables *nhscdays* *nhsc1day* and *nhschrs*.

Finally the net need in the household for eleven different forms of assistance is also identified by the prefix, *nh*. These forms of assistance are behaviour management (*nhabhavg*), decision making (*nhasdec*), coping with feelings (*nhaemot*), assistance with footcare (*nhafootc*), housework (*nhahome*), meal preparation (*nhameal*), paperwork (*nhapaper*), property maintenance (*nhaprop*), relationships (*nharship*), healthcare, other than footcare (*nhaskinc*) and private transport (*nhatrans*). These last 3 groups of variables make up the 21 instruments which are used in the econometric work.

Table 1: Descriptive Statistics, Adults 15 to 64 years

Variable	Definition	Women		Men	
		Mean	S. Deviation	Mean	S. Deviation
lfp	Labour force participation	0.681	0.466	0.834	0.372
married	Married	0.531	0.499	0.517	0.500
divsep	Divorced and separated	0.128	0.334	0.093	0.291
age1519	Aged 15-19 years	0.097	0.296	0.107	0.309
age2024	Aged 20-24 years	0.095	0.293	0.095	0.294
age2534	Aged 25-34 years	0.205	0.404	0.204	0.403
age3544	Aged 35-44 years	0.234	0.423	0.224	0.417
age4554	Aged 45-54 years	0.213	0.409	0.215	0.411
age5564	Aged 55-64 years	0.156	0.363	0.154	0.361
inner	Inner regional	0.217	0.412	0.218	0.413
other	Other areas	0.128	0.334	0.133	0.340
cy12	Completed Year 12	0.176	0.381	0.162	0.368
cert	Certificate or Diploma	0.240	0.427	0.332	0.471
degr	Bachelor/postgraduate degree	0.195	0.397	0.171	0.377
ftstud	Current full-time study	0.115	0.319	0.109	0.312
ptstud	Current part-time study	0.071	0.257	0.068	0.252
eng	English speaking country	0.843	0.364	0.852	0.355
prim	Primary carer	0.042	0.201	0.014	0.118
c020h	Up to 20 hours primary care	0.018	0.134	0.008	0.090
c2040h	20-40 hours primary care	0.008	0.091	0.002	0.048
c40p	Over 40 hours primary care	0.015	0.123	0.004	0.060
hcare	Average hours of primary care	1.128	6.271	0.314	3.186
partner	Primary carer is partner of dependent	0.010	0.100	0.007	0.081
fmother	Primary carer is parent of dependent	0.015	0.122	0.001	0.036
sdaugh	Primary carer is child of dependent	0.013	0.112	0.005	0.072
friend	Primary carer is friend# of dependent	0.004	0.066	0.001	0.033
pricores	Co-resident primary carer	0.032	0.176	0.011	0.106
prixcare	Non-resident primary carer	0.010	0.100	0.003	0.052
cores	Co-resident carer	0.118	0.323	0.106	0.308
xcare	Non-resident carer	0.056	0.229	0.028	0.164
sprof	Profound limitations core activities	0.012	0.108	0.010	0.097
ssev	Severe limitations core activities	0.032	0.176	0.025	0.157
smod	Moderate limitations core activities	0.036	0.187	0.032	0.177
smil	Mild limitations core activities	0.045	0.208	0.045	0.208
srscl	Some schooling restrictions	0.023	0.150	0.031	0.174
snscl	Disability no schooling restrictions	0.026	0.158	0.032	0.176
slth	Long term health condition, no disability	0.240	0.427	0.221	0.415

Source: ABS (2003)

Notes: 12,220 observations (women) & 11,813 observations (men) of adults residing in households.

ftstud incorporates secondary school attendance. Both *ftstud* & *ptstud* incorporate post-school study.

If hours of care for Primary Carers not stated, they are assumed to provide 0-20 hours of care per week.

#Friend denotes other relative, friend or neighbour.

4. Econometric models and results

4.1 Probit Equations

The dataset cannot identify the extent to which carers self-select due to inadequate qualifications or labour market opportunities because locational data are not available which would enable the construction of a job access variable, even if the ABS Remote Access Data Laboratory were utilised to undertake the econometric work. Consequently it was decided to focus on labour force participation rather than employment, because the latter is more sensitive to the availability of jobs, notwithstanding the discouraged worker effect.

Our first objective is to explore the impact of informal caring by adult women and men on labour force participation, assuming that the provision of care is exogenous. We run weighted probit equations and include a range of individual socioeconomic variables, and the household based measure of the number of adults minus one, and the number of children in the three age ranges to capture child care, in addition to care of the disabled and elderly. The base case is a non-English speaking, unmarried or widowed 25-34 year old (fe)male resident of a major city who has no children, did not complete Year 12, is not currently studying or providing informal care, and enjoys good health.

After testing a number of variables were excluded from the female equation, but *age1519* and *age2024* were retained to maintain the complete age range. The initial specification for men was retained, after testing. The socio-economic variables yield similar marginal effects across the different specifications of informal care for women and men, respectively so we just report the full results for the specification based on primary carers (*prim*) in Table 2, and summary results for other representations of care in Table 3.

All adult age variables are plausible for women. The number of children in successive age groups attracts a falling marginal effect and falling significance, as would be expected. On the other hand, only the presence of children aged between 0 and 4 impacts significantly (at 0.05) on male participation. The marginal effect associated with a university qualification is significant and larger in magnitude than the others. Full-time study impacts negatively at the 0.01 level for both adults, whereas part-time variable is positive and significant at 0.01 for women and 0.1 for men indicating a higher probability of participation, than someone not engaged in study.

The impacts of female and male health status also accord with expectation, but of interest is that the absolute values of the marginal effects for men for these variables and the primary care variable are higher than for women.

The hours of care variables yield increasingly significant marginal effects (Model 2). The impact on male participation of 20 or more hours of care is greater than for women. The consolidated hours variable is highly significant and negative for all adults. Providing care to a partner has the greatest negative impact on the participation of women (Model 4), followed by providing care to a friend, son or daughter and father or mother. On the other hand, for men, caring for a friend has the greatest marginal effect, followed father or mother, son or daughter and partner. These variables are all significant and the ordered marginal effects are all greater in absolute value than the ordered marginal effects for women.

Table 2: Labour force participation by gender: Weighted probit

Variables	Women		Men	
	Marginal Effects	Standard Error	Marginal effects	Standard Error
prim+	-0.144	0.026	-0.184	0.044
nhnad			0.007**	0.003
married+			0.085	0.010
divsep+			0.026**	0.010
inner			-0.008#	0.008
other			0.014#	0.009
age1519+	-0.034#	0.025	-0.055	0.019
age2024+	-0.030#	0.023	0.023*	0.012
age3544+	-0.013#	0.016	-0.016#	0.012
age4554+	-0.109	0.018	-0.064	0.015
age5564+	-0.431	0.019	-0.281	0.024
a04	-0.253	0.011	-0.019**	0.008
a59	-0.101	0.009	-0.012*	0.007
a1014	-0.041	0.009	0.009*	0.006
eng+	0.190	0.015	0.078	0.011
ftstud+	-0.281	0.024	-0.413	0.026
ptstud+	0.078	0.019	0.025*	0.013
cy12+	0.133	0.011	0.039	0.007
cert+	0.159	0.010	0.058	0.006
degr+	0.239	0.009	0.066	0.006
sprof+	-0.647	0.026	-0.693	0.052
ssev+	-0.402	0.030	-0.553	0.033
smod+	-0.276	0.030	-0.334	0.031
smil+	-0.216	0.027	-0.361	0.026
srscl+	-0.136	0.037	-0.191	0.030
snscl+	0.009#	0.030	-0.066	0.023
slth+	-0.016#	0.012	-0.017**	0.008
Log p/likelihood	-6017.940		- 3478.705	
Pseudo R ²	0.213		0.331	

Source: see Table 1.

Notes: + indicates that dy/dx is based on discrete change of the dummy variable from 0 to 1.

denotes insignificant at 0.1. *, ** denote significance at 0.1 and 0.05, respectively.

Remaining variables are significant at 0.01.

Weights are person weights provided by ABS (2003).

The co-residential variable for primary carers has a negative marginal effect and is strongly significant for women and men, whereas the extra-residential variable is insignificant (Model 5). The marginal effect for co-residents is greater in absolute terms for men, but this result is not repeated when all carers are considered, which may reflect men's ability to organise their informal care within the constraints of paid work, when they have a lower commitment to caring. This result was also found by Heitmueller (2004) in his British study. He suggests that the decision to provide care outside the home can be treated as endogenous, whereas caring within the home is treated as exogenous in that the informal carer has little choice. However he does not separately model female and male behaviour which is somewhat restrictive.

Table 3: Marginal effects for different representations of informal care

Model	Variables	Women		Men	
		Marginal Effects	Standard Error	Marginal effects	Standard Error
2	c020h+	0.002#	0.034	-0.045#	0.040
	c2040h+	-0.233	0.057	-0.239	0.106
	c40p+	-0.294	0.046	-0.514	0.099
	Log p/likelihood	-6001.067		-3465.410	
	Pseudo R ²	0.216		0.334	
3	hcare+	-0.006	0.001	-0.006	0.001
	Log p/likelihood	-6003.094		-3465.777	
	Pseudo R ²	0.215		0.333	
4	partner+	-0.288	0.058	-0.138	0.058
	fmother+	-0.112	0.043	-0.236	0.114
	sdaugh+	-0.067#	0.044	-0.186	0.078
	friend+	-0.196**	0.079	-0.364	0.159
	Log p/likelihood	-6011.824		-3477.378	
	Pseudo R ²	0.214		0.331	
5	pricores+	-0.192	0.031	-0.215	0.051
	prixcare+	-0.010#	0.048	-0.073#	0.080
	Log p/likelihood	-6012.143		-3477.358	
	Pseudo R ²	0.214		0.331	
6	cores+	-0.107	0.016	-0.023**	0.011
	xcare+	0.022#	0.021	0.003#	0.018
	Log p/likelihood	-6007.695		-3496.069	
	Pseudo R ²	0.215		0.328	

Source: see Table 1.

Notes: (+) dy/dx is for discrete change of dummy variable from 0 to 1

denotes insignificant at 0.1. *, ** denote significance at 0.1 and 0.05, respectively.

Remaining variables are significant at 0.01.

In Model 4 the variables represent the relationship of the primary carer to the dependent.

The explanatory power of the male equations, as measured by the pseudo R², is over 10 percentage points higher than the female equations, which provides support for a breadwinner perspective on men's behaviour. Until the age of 55 male participation is little affected by age, but is strongly influenced by marital status, and hence the likely presence of dependents. Any potential impediment, such as full-time study, caring responsibilities or poor health, impacts more strongly on male participation. This is likely to be influenced by the availability of part-time employment which can reflect stereotypical views as to what constitutes appropriate forms of employment on the part of both men and their prospective employers. The persistence of a gender gap in wages, even after correction for different occupational patterns of employment, often provides an incentive for women to undertake the unpaid caring roles within the family division of labour. This is reinforced by stereotypical views about women's greater capacity for nurturing and caring. On the other hand, the women's ability to participate in the labour market is likely to be contingent on a range of factors which are not captured in this dataset, including the timing and availability of paid employment and both formal care for the disabled and elderly as well as childcare. Previous studies have shown that their participation behaviour is more sensitive to the availability of jobs than men's, which again points to a breadwinner effect.

4.2 IV Probit Equations

The treatment of informal care as exogenous in the participation decision is questionable because the informal care variable is likely to be correlated with unobservable influences on the participation decision, such as a past phase on informal caring, thereby yielding biased and inconsistent estimates. One approach would be to treat the possible endogeneity of the caring decision by an Instrumental Value probit regression (see also Heitmueller, 2004). The extra-residential caring variable in both Models 5 and 6 is insignificant. The ABS survey does not provide any data which measures the ‘demand’ for care originating outside the home from relatives or friends, so it is impossible to find plausible instruments for extra-residential caring.

We employ the 21 instruments outlined in Section 3 which represent the incidence of different types of disability, needs for different forms of assistance and capacity for self-reliance within households, net of these characteristics for each adult who is part of the sample. These variables represent the net demand for care within the household.

The instruments perform relatively poorly if *pricores* is the chosen care variable, particularly for men. This is unsurprising because the instruments measure the net demand for assistance from all sources of care. Consequently it was decided to model co-residential care of all carers (*cores*), which represents a significant component of all informal care (see Section 3).

In the first stage of the IV probit estimation *cores* is regressed on the 21 instruments and the explanatory variables used in the female labour participation probit specification shown in Table 2. The results of this IV probit, which are not reported, reveal both the persistence of endogeneity from the Wald Test but also the invalidity of the instruments from the over-identification test. A test yielded zero coefficients on the following variables, *nhnad*, *married*, *divsep*, *inner*, *other*, *age1519*, *age2024*, *age3544*, *sns*, and *slth* in the 2nd stage equation. The restricted IV probit was re-estimated but again it failed to satisfy the two tests.

An ad hoc procedure was employed to fine-tune the instruments, so that they would satisfy the over-identification test. First a *cores* probit equation was estimated (as opposed to OLS which is performed in the STATA IV probit procedure) and the predicted *cores* values were saved and substituted for the actual observations in the female participation probit model. The residuals from this probit model were then regressed on the full set of explanatory variables, including instruments, but without a constant. $T \cdot R^2$ from this equation is distributed as a χ^2 with (L-1) degrees of freedom, since there is one endogenous variable, and constitutes a test of over-identification, where T denotes the number of observations and L is the number of instruments. The most statistically significant instruments in the final regression were then systematically deleted until the null was accepted.

With the smaller set of instruments, the IV probit was re-estimated and again the exclusion of the ten variables listed above was supported by a χ^2 test. The null of the Wald endogeneity test was satisfied and unsurprisingly the null of the over-identification test was supported. In addition, the STATA test *probxog* based on a first stage probit was satisfied, and a manual test of the validity of the instruments, as described above, also supported the null. The final IV probit regression is reported in Table 4. The results for the simple probit are also presented for comparison purposes.

Table 4: IV probit and probit estimation for female co-resident carers

Instruments	Cores (1 st stage IV probit)		Female lfp (2 nd stage IV probit)		Female lfp (probit)	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
nhsev	0.303	0.011				
nhmod	0.247	0.011				
nhmil	0.121	0.008				
nhnsc	0.043	0.009				
nhabhavc	0.304	0.016				
nhaemotc	0.159	0.010				
nhahome	0.123	0.009				
nhaprop	0.160	0.008				
nharship	0.016#	0.011				
nhscdays	0.013#	0.024				
nhsc1day	0.247	0.020				
Variables						
constant	0.013*	0.007	0.501	0.045	0.470	0.047
cores			-0.372	0.058	-0.305	0.042
age4554	0.034	0.006	-0.290	0.039	-0.274	0.040
age5564	0.047	0.007	-1.133	-0.042	-1.127	0.044
a04	0.019	0.004	-0.728	-0.027	-0.743	0.029
a59	0.021	0.004	-0.269	-0.025	-0.286	0.027
a1014	0.004#	0.004	-0.121	0.024	-0.114	0.025
eng	-0.001#	0.006	0.505	0.035	0.517	0.038
ftstud	-0.036	0.007	-0.797	-0.043	-0.788	0.046
ptstud	-0.015*	0.008	0.259	0.061	0.237	0.067
cy12	0.009#	0.006	0.422	0.038	0.435	0.041
cert	-0.001#	0.006	0.498	0.034	0.521	0.036
degr	-0.006#	0.006	0.862	0.041	0.868	0.043
sprof	-0.341	-0.021	-1.968	-0.159	-1.973	0.175
ssev	-0.160	-0.013	-1.047	-0.073	-1.033	0.081
smod	-0.114	0.012	-0.634	0.066	-0.692	0.074
smil	-0.074	0.011	-0.536	0.060	-0.547	0.066
srsc	-0.022#	0.014	-0.283	0.084	-0.343	0.093

Adj R-squared = 0.489 (cores equation)

Wald test of exogeneity: $\chi^2(1) = 2.31$; Prob > $\chi^2 = 0.1282$ Amemiya-Lee-Newey minimum chi-sq statistic: 14.939; $\chi^2(10)$ P-value = 0.1343

Source: Data obtained from SDAC (2003)

The results demonstrate that failure to capture the endogeneity of the caring variable *cores* leads to an underestimation of its impact on female participation behaviour. The remaining variables attract similar coefficients in the two specifications. Again the caring of young children impacts significantly on female participation, with older children having a smaller impact. Educational qualifications also contribute to participation as anticipated, with the coefficient on degrees attracting the largest, most significant coefficient.

A general IV probit specification was also estimated for male adults with the explanatory variables listed in Table 2, except for *prim* being replaced by *cores*, and the 21 instruments. This specification failed the Wald test of endogeneity. Also the adhoc procedure to identify a subset of the 21 instruments which would be valid in the IV probit specification failed with all the instruments being excluded without the test of over-identification being satisfied. A fully simultaneous bivariate probit specification would be required, which will be fully addressed in later research. Preliminary results point to the full simultaneity of the decisions to care and participate.

5. Concluding Comments

In this paper we find that providing co-residential informal care impacts strongly on labour force participation behaviour of both women and men, but there are fundamental differences in their behaviour which is not confined to the impact of socio-economic variables, such as marital status and the presence of young children. Women appear to treat the decision to provide co-residential care as exogenous to the participation decision, while men consider this decision to be endogenous, so that they have some discretion about whether to take up caring responsibilities.

The female IV probit equations imply that there is an increasing age related impact on the probability of engaging in informal care, after the age of 45, but preliminary male bivariate probit results do not indicate that men aged between 55 and 64 will have a higher incidence of informal care, even though they experience a significant decline in their labour force participation rate. These results provide support for the caregiving/breadwinner model.

The tension between paid work and informal care is likely to intensify over the decades ahead. The ABS (2003, pp.21-22) estimates that those aged over 60 accounted for 53.2% of dependents with profound limitations, 36.5% with severe limitations and 47.6% with moderate limitations of those living in private accommodation. The incidence of these restrictions increased has been increasing. Also the number of citizens over 80 years old is projected to almost triple to 9.1% of the population over the next 40 years. The Productivity Commission (2005) argues that the number of low and high care residents in institutions could increase by around 215 per cent over this period. The results from this paper do not instill confidence that adequate informal care will be available in the context of this ageing population.

In fact the Productivity Commission (2005, pp. 179-180) suggests that there is likely to be a significant long term shortage of potential informal carers due to a range of supply side factors (see also NATSEM, 2004). First, it is anticipated that by 2021 'less than half of people over 65 will be living in couple families (AIHW 2004, p. 31)' even though many older people are currently cared for by their partners. Second, the supply of potential carers per family will fall due to the reduced birthrate. Third, women have exhibited an increasing labour force participation rate, which has been given further impetus by changes in superannuation arrangements. Also they are having children later, which will reduce their capacity, and possibly their willingness to provide aged care. In addition, greater mobility among younger generations may reduce the access of elderly persons to informal care (Saunders, 1996). Retirees now tend to be more active and may be reluctant to commit to long term caring responsibilities. Davis, Heathcote, O'Neill and Puza (2002, p.1) claim that at least two thirds of the increased life expectancy over the decade 1988-98 was associated with coping with disability, so increased life expectancy will not necessarily increase the supply of informal care.

For the last 20 years or so State and Federal Governments have promoted de-institutionalisation, ostensibly in response to the desire for independence and dignity for those with core limitations, but undoubtedly in part due to their fiscal preoccupations. McCallum and Mundy (2002), quoted in NASTSEM (2004, p.7), report that most people prefer these living arrangements, but independent living requires access to adequate resources, as well as supportive social policy (Rowland, 1991, pp.113-115). International empirical studies also find that informal care reduces the likelihood of nursing home entry and improves self-reported health status (see, Charles and Sevak, 2005, Stabile, Laporte and Coyte, 2006, and Van Houtven and Norton, 2004), but AIHW (2004, p. xvi) found that a primary carer was essential, if a dependent with high levels of assistance with core activities was to remain at home.

The Federal Government currently provides Community Aged Care Packages, a package of home based services tailored to meet the needs of older people as assessed by Aged Care Assessment Teams. A strong public sector commitment is required to meet the growing demand for complementary informal care which would have the additional benefit of reducing the caring demands on adult members of households who wish to participate in the labour market.

From an orthodox macroeconomic perspective, the fiscal impact of these increased outlays on formal care provides a major policy challenge (Productivity Commission, 2005). An alternative perspective is provided by advocates of a Job Guarantee (Buffer Stock Employment) model (see, for example, Mitchell, 1998), who argue that sustained full employment can be achieved by guaranteeing all unemployed workers a job at the minimum wage. A flexible system of formal care provided by Job Guarantee workers, which meets the needs of carers and their dependents, is an excellent example of how this macroeconomic policy could work in practice.

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