

The Price of Time for Informal Female Caregivers of the Elderly: A Comparison of Two Methodologies

This study utilizes the 1992 wave of the Panel Study of Income Dynamics (PSID) to estimate the price of time for informal caregivers of elders who co-reside with adult children. It estimates both a reservation and imputed wage. Based on the theory of household production and the empirical results, the reservation wage appears to be a more accurate measure of time spent in caregiving.

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Introduction

Care for elders in their oldest years tends to be extremely time consuming, exhausting, and expensive. Informal care, which is any care that is provided to an elder without an explicit monetary cost, comprises a large proportion of the care for elders who live at home. Providers of informal care usually include peer friends, and relatives who are most often children, more specifically daughters. The costs to these caregivers can be very substantial emotionally, socially, physically, and financially. The objective of this study is to quantify the cost of informal caregiving for unemployed, married, female caregivers. Two methods are used to estimate a wage rate for caregivers. The first calculates an *imputed market wage* based on their market wage determining characteristics. The second calculates a *reservation wage rate*, a measure of the price of the time spent in household production.

Related Literature

The opportunity costs related to informal care can often be very significant. Miller (1981) has coined the term 'sandwich generation' for the generation of adult child caregivers who are sandwiched between their aging parents and their own maturing children. These caregivers, named as the major resource and support group for the elderly, face competing role demands. Informal caregivers of the elderly are often not employed in the labor market as a result of caregiving responsibilities. Stone and Short (1990) found that 49.5% of child caregivers were not employed in the labor market while 25.2% were employed with some type of accommodation. Of employed caregivers, 30% had reported quitting their jobs or reducing hours of work in order to care for someone (Stone, Cafferata, and Sangl, 1987). In studies of time allocation of caregivers, it is found that caregiving significantly affects hours of market work (Ettner, 1995a, 1995b; Stone and Short, 1990).

Research on informal caregivers of the elderly finds that females, more specifically, adult daughters comprise the majority of primary informal caregivers in the U.S. (Brakman, 1994; Konrad and Lommerud, 1995; Finley, 1989; Dwyer, Folts, and Rosenberg, 1994; Lee, Dwyer, and Coward, 1993; Stone et al., 1987). Stone et al. (1987) found in a nationwide survey of informal caregivers that more daughters than sons reported work conflicts, working fewer hours, rearranged schedules, and took time off without pay as a result of caregiving responsibilities.

Conceptual Model

The methods used here to estimate the imputed market wage and reservation wage rate are based on the theories of labor supply and household production (Becker, 1965). A household derives utility from goods and services purchased in the market, commodities produced in the household and leisure time. The 'amount' of utility that a household can enjoy is constrained by the household's resources available to them in the observed time period, measured by the household's budget constraint. The household production function measures the productivity of an individual's time spent in household work. Its value is termed the reservation wage rate. In addition to household production, an individual can engage in market work. The imputed market wage is the slope of the market work budget line. This wage is what could be earned by an individual if s/he entered to the market to work. The slope of the market work budget line where it lies beneath the household production must be imputed

since a real wage rate is not observed. The imputed market wage and the reservation wage rate have been used to estimate the value of time for unemployed persons (Abdel-Ghany and Sharpe, 1996; Duncan, 1996; Heckman, 1974; Kidd, 1993; Wang, 1994; Zick and Bryant, 1983, 1990).

Data

The 1992 wave of the Panel Study of Income Dynamics (PSID) is used to estimate and compare the imputed and reservation wage rates of married female caregivers of elders. The PSID contains detailed economic information, and the 1992 wave provides extensive information on the health status of elders. These measures of health serve as a proxy for informal caregiving in the household (see, Ettner, 1995a, 1995b; Wolf and Soldo, 1994).

It was important to identify households that were coresiding in both 1991 and 1992 that had not experienced any change in its coresidence status. Since information was needed on working caregivers for the model, caregiver age was restricted to between 18 and 64. Using these guidelines, the sample included married couple households with at least one elder living in the household in both 1991 and 1992, providing an unweighted sample size of 185 households. Variables included in the analyses are the caregiver's and the elder's demographic characteristics, including gender, age, education, and health. Age of the youngest child is interacted with a dummy variable for the presence of dependent children to control for households with no dependent children. Work experience is measured by the number of years the caregiver has worked full-time for at least six months in the past ten years. Health of the elder is measured by the number of difficulties with ADLs or IADLs. Household characteristics including the number of rooms in the home, a dummy variable for household health (indicating that at least one household member besides the elder has a health condition), and a dummy variable indicating adequate living space as reported by the household head, as well as regional characteristics are also included in the analyses. Since the data are nationally representative, regional characteristics are included to control for differences in unemployment rates and wages that exist across the country. The sample is weighted to make it representative of households in the United States (Hill, 1992). Table 1 provides descriptive statistics of the weighted sample.

Empirical Models

Reservation Wage Rate

The specific methodology of the opportunity cost method varies by study (Abdel-Ghany and Sharpe, 1996; Kidd, 1993; Wang, 1994; Zick and Bryant, 1983, 1990). The three stage method developed by Heckman (1974) of estimating a reservation wage rate is used. The probability of work equation, estimated using Probit, is written as:

$$Y = \beta_0 + \beta_1 C_AGE + \beta_2 C_EDUC + \beta_3 C_KIDS + \beta_4 WRKEXP + \beta_5 HHELDER + \beta_6 OWNSHOME + \beta_7 HHILL + \beta_8 ADLS + \beta_9 IADLS + e \quad (1)$$

The second stage is comprised of three equations, the wage rate for employed caregivers, the reservation wage rate for nonemployed caregivers, and hours of work for employed caregivers. The wage and hours equations are estimated using Ordinary Least Squares (OLS). The equations are:

$$W = \beta_0 + \beta_1 C_AGE + \beta_2 AGESQ + \beta_3 C_EDUC + \beta_4 WRKEXP + \beta_5 EXPSQ + \beta_6 AREA + \beta_7 UNEMP + \beta_8 LAMBDA + e_1 \quad (2)$$

$$W^* = \beta_0 + \beta_1 C_AGE + \beta_2 AGESQ + \beta_3 C_EDUC + \beta_4 WRKEXP + \beta_5 EXPSQ + \beta_6 AREA + \beta_7 LAMBDA + \beta_8 LABINC + \beta_9 TRNSINC + \beta_{10} ASSTINC + \beta_{11} SSINC + \beta_{12} C_KIDS + \beta_{13} OWNSHOME + \beta_{14} HHILL + \beta_{15} HHELDER + \beta_{16} ADLS + \beta_{17} IADLS + \beta_{18} SIZE + \beta_{19} AGEYNG + \beta_{20} E_AGE + \beta_{21} E_SEX + \beta_{22} E_EDUC + \beta_{23} RACE + \beta_{24} HRS + e_2 \quad (3)$$

where W is the market wage rate, W^* is the reservation wage rate, and e is an error term. The equation for the market wage rate is then set equal to the reservation wage rate for the sample of employed women since their reservation wage rates are equal to their market wage rate; the two equations are solved for hours of market work.

$$HRS = E_0 + E_1 C_AGE + E_2 AGESQ + E_3 C_EDUC + E_4 WRKEXP + E_5 EXPSQ + E_6 AREA + E_7 UNEMP + E_8 LAMBDA + E_9 LABINC + E_{10} TRNSINC + E_{11} ASSTINC + E_{12} SSINC + E_{13} C_KIDS + E_{14} OWNSHOME + E_{15} HHILL + E_{16} HHELDER + E_{17} ADLS + E_{18} IADLS + E_{19} SIZE + E_{20} AGEYNG + E_{21} E_AGE + E_{22} E_SEX + E_{23} E_EDUC + E_{24} RACE + e_2 \quad (4)$$

Once the coefficients have been determined for the hours of work and market wage rate equations, the coefficients for the reservation wage equation are calculated.

Imputed Market Wage

The method proposed by Kidd (1993) is a computationally simpler alternative approach that is based on Heckman's two-stage procedure. Heckman's model is criticized for its assumed bivariate normality of the regime-specific error term and the sample selection criterion equation error term. The bias arising from OLS estimation on a non-random sample is interpreted as an omitted variable bias. This problem is corrected through deriving the specification of the omitted variable, or the inverse of the Mill's ratio as calculated through the Probit estimation on the probability that a female works in the labor market, and uses this variable, lambda, as a regressor in the regime-specific structural equation. Kidd (1993) suggests the adoption of a variable representing the number of dependent children (KIDS) as an alternative proxy variable to Heckman's lambda term. Other research findings suggest that although number of dependent children do affect the probability of female participation and thus affect market wages, there is no direct causal relationship between wages and KIDS. We also include the number of elders in the household, HHELDER, for whom a daughter may provide care.

Following Kidd's method, the wage equation is run with KIDS and HHELDER as additional regressors using OLS. The variable KIDS and HHELDER serve as proxy variables for lambda in this equation identifying sample selection bias. The coefficients obtained from this equation are then used to calculate an imputed market wage for unemployed persons. The wage equation is written as:

$$W = \beta_0 + \beta_1 C_AGE + \beta_2 AGESQ + \beta_3 C_EDUC + \beta_4 WRKEXP + \beta_5 EXPSQ + \beta_6 AREA + \beta_7 UNEMP + \beta_8 KIDS + \beta_9 HHELDER + \epsilon_1 \quad (5)$$

This wage is a measure of how much this person could potentially earn if s/he were employed in the labor market. It is different from a reservation wage rate which measures the price of a person's time in household production because the imputed wage from Kidd's method incorporates only market wage determining characteristics, *not* household production determining characteristics.

Results

Reservation Wage Rate Estimation

Table 1 shows the results of the OLS analyses and the calculated reservation wage rate coefficients for the sample. Lambda is not significant for either the wage or the hours equations indicating that sample selection bias is not present in this model. The calculated reservation wage rate based on weighted means of the sample is \$5.42. The caregiving variables included in the analyses indicate that having elders in the household and the number of difficulties with IADLs the elder experiences increases the reservation wage rate. However, someone with a health condition in the household, the elder's age, and the number of difficulties with ADLs as reported by the elder have negative coefficients. These results are surprising; it was hypothesized that they would have positive coefficients. The negative coefficients may be explained in two ways. It is possible that the caregiver could be using formal services to care for elders who are frail or ill. The reduction in the reservation wage rate caused by the negative coefficients may increase the likelihood of the caregiver entering the labor market sooner to pay for formal services.

Another explanation may be that the production function for the household task of caring for an elder is such that time spent in performing the caregiving tasks results in a negative output for overall household production since only the elder benefits from the task being performed. In other words, during time spent in caregiving tasks the caregiver is operating on the negatively sloped section of the household production function where an additional unit of time spent on those tasks actually reduces the amount of output of household goods.

Imputed Market Wage Rate

Table 1 shows the results from the OLS equation. While only education was found significant, education and work experience both increase the market wage rate with work experience increasing the wage rate at an increasing rate. Age increases the wage rate at a decreasing rate. These findings are consistent with previous studies (Abdel-Ghany and Sharpe, 1996; Kidd, 1993). Both number of dependent children and number of elders in the household were not significant indicating that sample selection bias is not a problem in this equation. Recall for comparison that Heckman's lambda was not found significant for the wage equation. The calculated wage rate for the unemployed sample of caregivers is \$2.20 based on weighted descriptives of the sample. This finding is consistent with economic theory stating that the individual will spend his/her time in the most productive activity.

Table 1
Descriptive Statistics and Parameter Estimates.

Variable	Definition	Mean (S.D)	Reservation Wage			Imputed Wage	
			Wage	Hours	Res. Wage	Actual Wage	Imputed Wage
C_AGE	Caregiver's age in years	55.46(8.09)	-.13 (.71)	45.77(86.0)	-.16	.53(.72)	-7.03(9.21)
C_KIDS	Number of kids under 18	.29(.68)		-294.9(131)*	.24	-47(1.04)	-1.66(.70)*
YNGKID	Age of youngest child if c_kids>0	1.42(3.77)		48.91(21.58)*	.04		
C_EDUC	Yrs. of education for caregiver	12.28(2.83)	1.02 (.21)*	-104.75(25.6)*	1.10	.68(.20)***	.64(.16)*
WRKEXP	# yrs worked full-time	4.61(3.95)	-.52(1.47)	14.4(19.0)	-.53	.77(.54)	.11(.52)
LABINC ^a	HH labor income	24213.10(7159.1)		-.1739E-03 (.1161E-02)	1.38E-07		
TRNSINC ^b	HH transfer income	2905.11(5549.64)		-.30E-01(.16E01)*	2.42E-05		
ASSTINC ^b	HH asset income	1373.68(3351.18)		-.43E-01(.41E.01)	3.39E-05		
OWNSHOME	= 1 if home is owned	.89 (.31)		157.43(227.92)	-.12		
SIZE	# of rooms in the home	6.60 (2.40)		1.17(1.52)	9.3E-04		
ADQSPACE	= 1 if #rooms > #required	.96(.19)					
HHILL ^c	= 1 if a hh member has hlth cond.	.29(.46)		769.32(305.2)*	-.61		
HHELDER	# of elders in the household	1.06(.24)		135.74(572.82)	-.11	-3.37(2.31)	-3.02(1.43)*
RACE	=1 if head and wife are white	.81(.39)		-70.15(169.76)	.06		
AREA	= 1 if household is in a SMSA	.45(.50)	-.87(.30E-01)	-116.16(35.1)	.01	-.29(.26)	.03(.23)
UNEMP	Local area unemployment rate	6.72(2.08)	.93E01(.30)	116.66(34.91)*		.29(.26)	.03(.22)
E_AGE	Elder's age in years	73.07(7.29)		11.37(13.36)	-.01		
E_SEX	Elder's gender (= 1 if male)	.78(.41)		-91.43(200.84)	.07		
E_EDUC	Elder's education in years	10.46(4.14)		.40(.37)	-3.19E-04		
ADLS	# of difficulties with ADLs	.96(1.76)		138.14(69.47)*	.11		
IADLS	# of difficulties with IADLs	1.12(1.82)		- 301.93(84.75)*	.24		
WAGE	Hourly wage rate	5.98(8.97)					
HOURS	Annual hours of work	784.08 (888.41)			7.96E-04		
LAMBDA	Sample selection		.22(4.0)	-826.70(579.05)	.88		

^a Excludes caregiver's and elder's labor income; ^b Excludes elder's income; ^c Excludes the elder
* p-value < .10, **p-value < .05, ***p-value < .01

Discussion

Overall, we found that the caregiver's time is worth \$5.10 per hour in household production while their time spent in market work is worth \$2.20. These wages can be considered an upper and lower estimate of the value of a caregiver's time. The imputed wage method only accounts for factors that influence productivity in the labor market, and thus is an estimation of the value of *market* work by unemployed women. The reservation wage method accounts for factors that affect household productivity and thus is an estimation of the value of household labor. It is known that the costs of informal care to caregivers can be large. Existing research has provided significant information regarding the *existence* of social, emotional, physical, and financial costs of informal elder care, but have lacked information that *quantifies* these costs.

This study found that caregiving affects the labor supply of married female caregivers in different ways. As hypothesized, the number of elders in the household reduces the probability of employment. The health of the elder as measured by the number of ADLs and IADLs the elder reports difficulty with have different effects on hours of market work. The number of ADLs increases work hours while the IADLs reduce work hours. Since ADLs are needs which could be met by formal services, such as a visiting nurse or home health aide, it is possible that the caregiver is increasing work hours to help pay for these services. Findings from the reservation wage equation are somewhat surprising. It was hypothesized that the number of elders in the household, health of elder, and age of elder would all increase the reservation wage rate. In fact, they all decrease it. The negative coefficients for these variables may be explained by the use of formal services. The PSID lacked information regarding formal care services and therefore this explanation cannot be explored. However, it is known that the use of formal services by informal caregivers of the elderly is becoming increasingly popular, especially as the number of women entering the labor force increases. The top two fastest growing occupations for 1994-2005 are personal home care aids (+119%) and home health aids (+102%) (US Bureau of the Census, 1996). Future research should examine the use and role of formal services.

Another explanation for the negative coefficients could be that caring for an elder is such that it actually reduces household output since the only elder benefits from this task. Time spent in caregiving tasks would then lie on the negatively sloped section of the household production function. Just as employed caregivers experience a loss in wages through a reduction in work hours as a result of caregiving, unemployed caregivers also experience decreased productivity in the household. This not only has implications for the caregiver but also for the household. Either members of the household consume less household goods, such as clean laundry or a cooked meal, or they must increase their time in household production to maintain the same level of consumption.

The imputed wage method reveals much less to us about the caregiving household. This method estimates the value of time based on market wage determinants and therefore is estimating the value of a person's time in the *market* and not in the *household*. The reservation wage method incorporates household production characteristics and is therefore a more accurate measure of the price of time in household production, or more specifically caregiving. The results of this study show that the caregiver's time is worth much more spent in the household caring for the elder rather than working in the market place (to pay for formal services). This outcome confirms the theory of labor supply.

The primary objective of this study was to estimate the value of informal care to elders. Families are a large part of long-term care arrangements for elders. The estimates provided here are a step toward the recognition of the importance of families as caregivers. They can be used in determining an amount of reimbursement or subsidy for informal caregivers in future elder care policies. Families are a huge resource for elders and it is important that policy makers do not neglect this resource as the elder population grows and budgets for elder care decrease.

References

- Abdel-Ghany, M. and D. Sharp. (1996). Measurement of the Value of Homemaker's Time: A Comparison of the Alternative Methods of the Opportunity Cost Approach, Consumer Interests Annual, 42, 285-290.
- Becker, G. (1965). A Theory of the Allocation of Time, Economic Journal, 75, 493-517.
- Boaz, R. (1996). Full-Time Employment and Informal Caregiving in the 1980s, Medical Care, 34(6), 524-536.
- Brakman, S. (1994). Adult Daughter Caregivers, Hastings Center Report, 24(5), 26-28.
- Brody, E. (1990). Women in the Middle: Their Parent Care Years. New York: Springer Publishing Company.
- Bryant, K. (1990). The Economic Organization of the Household. New York: Cambridge University Press.

- Daniewicz, S. (1995). When Parents Can't Live Alone: Choosing Multi-Generational Households, Journal of Gerontological Social Work, 23(3/4), 47-63.
- Duncan, K. (1996). The Reservation Wage and the Value of Household Work Time: Estimates for Canada, Consumer Interests Annual, 42, 291-296.
- Dwyer, J., W. Folts, and E. Rosenberg. (1994). Caregiving in Social Context, Educational Gerontology, 20, 15-631.
- Ettner, S. (1995a). The Impact of Parent Care on Female Labor Supply Decisions, Demography, 32(1), 63-80.
- Ettner, S. (1995b). The Opportunity Costs of Elder Care, The Journal of Human Resources, 31(1), 189-205.
- Greenberg, J., W. Luetz, M. Greenlich, J. Malone, S. Ervin, and D. Kodner. (1988). The Social HMO Demonstration: Early Experience, Health Affairs, 7(3), 66-79.
- Gottlieb, B., K. Kelloway, and M. Fraboni. (1994). Aspects of Eldercare that Place Employees at Risk, The Gerontologist, 34(6), 815-821.
- Heckman, J. (1974). Shadow Prices, Market Wages, and Labor Supply, Econometrica, 42(4), 679-694.
- Heckman, J. (1979). Sample Selection Bias as a Specification Error, Econometrica, 47(1), 153-161.
- Hedrick, S and T. Inui. (1986). The Effectiveness and Cost of Home Care: An Information Synthesis, Health Services Research, 20(6), 851-880.
- Hicks, B., J. Segal, and N. Doherty. (1981). The Triage Experiment in Coordinated Care for the Elderly, American Journal of Public Health, 71(9), 991-1003.
- Hughes, S., J. Cummings, F. Weaver, L. Manheim, K. Conrad, and K. Nash. (1990). A Randomized Trial of Veterans Administration Home Care for Severely Disabled Veterans, Medical Care, 28(2), 135-145.
- Hughes, S., L. Manheim, P. Edelman, and K. Conrad. (1987). Impact of Long-Term Home Care on Hospital and Nursing Home Use and Cost, Health Services Research, 22(1), 19-47.
- Hofler, R., and K. Murphy. (1994). Estimating Reservation Wages of Employed Workers Using a Stochastic Frontier, Southern Economics Journal, 60(4), 961-976.
- Hudson, J., R. Nutter, B. Galaway, and G. Richardson. (1994). Foster Family Care for Elders, Adult Residential Care Journal, 8(2), 65-75.
- Jones, S. (1988). Reservation Wages and the Cost of Unemployment, Economica, 225-246.
- Keita, G., and J. Hurrell. (1994). Job Stress in a Changing Workforce, Washington, D.C.: American Psychological Association.
- Kidd, M. (1993). Sample Selection in a Model of Female Labour Supply: An Alternative Approach, International Journal of Manpower, 14(1), 11-12.
- Konrad, K. and Lommerud, K. (1995). Family Policy with Non-cooperative Families, Scandinavian Journal of Economics, 97(4), 581-601.
- Lee, G., J. Dwyer, and R. Coward. (1993). Gender Differences in Parent Care: Demographic Factors and Same-Gender Preferences, Journal of Gerontology, 48(1), S9-S16.
- Lee, G. and E. Ellithorpe. (1982). Intergenerational Exchange and Subjective Well-being Among the Elderly, Journal of Marriage and the Family, 217-224.
- Maloney, T. (1990). Unobserved Variables and the Elusive Added Worker Effect, Economica, 58, 173-187.
- Miller, D. (1981). The 'sandwich' generation: adult children of the aging, Social Work, 419-423.
- Moss, M., M. Lawton, M. Powell, Kleban, H. Morton, and L. Duhamel. (1993). Time Use of Caregivers of Impaired Elders Before and After Institutionalization, Journals of Gerontology, 48(3), S102-S111.
- Mundinger, M. (1990). Will you still need me, Will you still feed me, When I'm eighty-four? Academic Nurse, 9(1), 24-7.
- Neal, M., N. Chapman, B. Ingersoll-Dayton, and A. Emlen. (1993). Balancing Work and Caregiving for Children, Adults, and Elders, Newbury Park: Sage Publications.
- Scharlach, A. (1989). A Comparison of Employed Caregivers of Cognitively Impaired and Physically Impaired Elderly Persons, Research on Aging, 11(2), 225-243.
- Scharlach, A. (1994). Caregiving and Employment: Competing or Complementary Roles?, The Gerontologist, 34(3), 378-385.
- Somers, F. (1991). Long-Term Care and Federal Policy. The American Journal of Occupational Therapy, 45(7), 628-635.

Stone, R., G. Cafferata, and J. Sangl. (1987). Caregivers of the Frail Elderly: A National Profile, The Gerontologist, 27(5), 616-626.

Stone, R. and P. Short. (1990). The Competing Demands of Employment and Informal Caregiving to Disabled Elders, Medical Care, 28(6), 513-526.

Strawbridge, W. and M. Wallhagen. (1992). Is All in the Family Always Best?, Journal of Aging Studies, 6(1), 81-92.

Tunali, I. (1986). A General Structure for Models of Double-Selection and an Application to a Joint Migration/Earnings Process with Remigration, Research in Labor Economics, 8(Part B), 235-282.

Wang, Y. (1994). Effects of the Price of Time on Household Saving: A Life-Cycle Consistent Model and Evidence from Micro-Data Southern Economics Journal, 60(4), 832-843.

Wolf, D. and B. Soldo. (1994). Married Women's Allocation of Time to Employment and Care of Elderly Parents The Journal of Human Resources, 28(4), 1259-1276.

Zick, C. and W. Bryant. (1983). Alternative Strategies for Pricing Home Work Time Home Economics Research Journal, 12(2), 133-144.

Zick, C. and W. Bryant. (1990). Shadow Wage Assessments of the Value of Home Production: Patterns from the 1970's, Lifestyles: Family and Economic Issues, 11(2), 143-160.

Endnotes

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