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Does the expectation of having to look after parents in the future affect the quality of children?

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***Abstract*— This paper investigates whether the expectation of future care for aging parents affects the quality of children. When the quality of children is measured using the level of their education, it is found that for the third child, especially if the child is male, an increase in this expectation of a future burden leads to a reduction in the level education investment for this child.**

***Keywords*—aging, *burden,* children, ordered probit, quality of children**

I. Introduction

The purpose of this paper is investigate whether the expectation of having to care for aging parents in the future affects the quality of children as measured by the level of their education. It is well-known that aging in Japan is proceeding at a very rapid rate, and various effects of this aging have been discussed. For example, Horioka et al.'s (2007) discuss the effect of aging on Japan's savings and public pensions, Komine and Kabe (2009) forecast the demographic transition in Japan, and Hoshi and Ito (2013) simulate the impact of increasing social security payments on the budgetary position of the Japanese national government. In related research, the authors, Sakata and McKenzie (2014), have investigated whether the expected burden of looking after parents has an impact on either (a) the decision to have children, and (b) given a couple decides to have children, the number of children. Sakata and McKenzie (2014) find that the dependency ratio which measures this expected burden has no effect on the number of children couples decide to have, given that they have decided to have children. However, an increase in the ratio does have the effect of increasing the probability of a couple not having any children. In contrast, in this paper the focus is on the potential impact of expected future care of parents on couple's investments in their children's education.

The plan of the paper is as follows. Section II discusses some of the literature relating to the determinants of investment in children, and the potential relevance of the expectation of having to look after parents in the future for investment in children. The data used in this paper and the sample selection rules adopted are discussed in section III. Section IV reports the results of estimating some ordered probit models for the education levels of children. A short conclusion is contained in section V.

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II. Investment in Children

Neoclassical economic theory of fertility contends that the decision to have a child is a function of the costs and benefits of children subject to an income constraint and to individuals' preference for children. Since these costs benefits and benefits may arise today as well as in the future, this must involve an intertemporal optimization problem. Under such a utility maximization process, the neoclassical economic theory of fertility predicts that any reduction in the cost of having children or any increase in income induces an increase in the demand for children (Becker 1981). If an individual has to leave the labour force or reduce his/her labour supply so as to care for frail and aging parents, the individual's lifetime income will be reduced dramatically. In addition, if the cost of (an)other good(s) increases, namely the future care for the aged parents, individuals may have to compromise their consumption on children. Sakata and McKenzie (2014) argue that any increase in the cost of future care for aged parents will reduce the demand for children. Thus, an increase in future burden of caring for frail and aging parents reduces the demand for children. Sakata and McKenzie (2014) find that the dependency ratio has no effect on the couples who decided to have children, but there some impact on the decision of whether to be childless couple or not..

Becker's "Quantity and Quality" model assumes that investments in a child lead to a higher level of child quality, and indicates that there is a trade–off between investment in children and the number of children in the family (Becker, 1960; Becker and Lewis, 1973; Becker and Tomes, 1976). In empirical studies, the negative impact of family size on child's outcomes has been often studied by using academic achievements as a measure of child quality (Rosenzweig and Wolpin, 1980; Hauser and Sewell, 1986; Hanushek, 1992; Black et al., 2005; Conley and Glauber, 2006). As the National Family Research of Japan (NFRJ) surveys do not contain information measuring the direct investments in a child's education, we also use the child's academic achievement as a measure of the outcome of investment in education.

The idea of this paper is to try and predict the "quality" of a couple's children using only information that was available at the time the couple married. We measure the quality of children by their level of educational attainment. NFRJ

contains information on the educational attainment of the children. For his/her children, the NRFJ survey asks the respondent "which school did this person last attend (or is this person still attending)? (Answer whether or not s/he graduated)". Using such information, we created a categorical outcome variable taking an integer value between one and five : Compulsory education only (=1); High school (=2); Vocational college (after high school) (=3); Junior college or technical college (=4); and Four-year university or more (=5).

In order to measure the future burden of caring for aged parents, we construct a "dependency ratio" as follows:

dependency _ratio=(Number of parents alive at the time of the marriage)/(Number of siblings+2) (1)

where the number of siblings refers to the total number of siblings of both the husband and wife, and the number of parents refers to the total number of parents of the husband and wife. In the denominator, we also added 2 to account for the respondent and the spouse. We assume that couples decide on their family size at the time of their marriage. We could not incorporate information on the timing of the death of parents because such information is not fully available for parents-in-law in our data set. This dependency_ratio is the variable of interest, and we expect it to have a negative impacts on the quality of children, and in particular on their level of education size. The burden could be financial, physical as well as psychological. In other research, we have find that the dependency ratio has no effect on the couples who decided to have children (Sakata and McKenzie (2014)). If the future burden of caring for aged parents does matter for married couples, then there may be a possibility that these couples maintain the size of their family, but may have reduced their investments in their children's education. Thus, the goal of our research here is to shed the light on whether or not couples with children maintain their family size and consumption for caring for aged parents, but reduce the quality of their children (the educational attainment of these children).

We estimate separate ordered probit models for the educational attainments of the first child, the second child, and the third child. The ordered probit models are of the following form:

$$y_i^*=x_i'\beta+u_i,\ i=1,..,N \quad (2)$$

where y_i^* is an unobserved latent variable, x_i is a kx1 vector of observed explanatory variables, β is a kx1 vector of unobserved coefficients, and u_i is normally, identically and independently distributed unobserved error term. The unobserved y_i^* is related to the observed educational attainment of children y_i as follows:

$$y_i=1 \text{ if } y_i^*\leq 0 \quad (3a)$$

$$y_i=2 \text{ if } 0< y_i^*\leq \mu_1 \quad (3b)$$

$$y_i=3 \text{ if } \mu_1< y_i^*\leq \mu_2 \quad (3c)$$

$$y_i=4 \text{ if } \mu_2< y_i^*\leq \mu_3 \quad (3d)$$

$$y_i=5 \text{ if } \mu_3< y_i^*, \quad (3e)$$

where the μ_j (j=1,2,3) are unknown cut-off parameters that need to be estimated together with β. In order to be able to identify the parameters of the model, the following three standard assumptions are made: (a) $E(u_i)=0$ for all i; (b) $V(u_i)=1$ for all i; and (c) x_i does not include an intercept are imposed (see Cameron and Trivedi, 2006). For a continuous variable x_i, it should be noted that $\delta E(y_i^*)/\delta x_i=\beta$, but the expressions for $\delta Prob(y_i=J)/\delta x_i$ =(J=1,..,5) are much more complicated functions of all the parameters and all the explanatory variables for individual i (see Cameron and Trivedi, 2006, p. 520).

For the purpose of this paper, the three key variables that are of interest are (a) the dependency ratio; (a) a 0-1 dummy variable for the husband only having one parent alive, One_parent_h; and (c) a 0-1 dummy variable for the wife only having one parent alive, One_parent_w. These three variables seek to proxy the future (or even current) burden of caring for aged parents. If only one of the individual's parents are alive, we expect that the probability of having to look after that parent is much higher than if both parents are still alive. We do not have information on if and when the parents-in-law die, so we cannot take account of such impacts in analyzing the investments on children. The other control variables contained in x_i include the husband's age, the wife's age, the husband's level of education, the wife's levels of education, the husband's age at the time of his marriage, the wife's age at the time of her marriage, the number of children, an urban dummy and a survey year dummy.

According to the Ministry of Education, Culture, Sports, Science and Technology (2013), 95% of high school graduates who wish to go to university actually enter a university within two years after graduating from high school at the age of 18. Thus, we confine our sample to children who are aged 20 or older assuming that by the age of 20, the investments in the child is finalized. We also divide the sample according to the gender of the child in order to examine whether there exists gender effects in the investment in children.

III. Data

Our data are drawn from the 1998 and 2008 National Family Research of Japan (NFRJ,Kazoku nitsuiteno Zenkoku Chousa) surveys. The survey is conducted by the Japan Society for Family Sociology and the data is archived in the Social Science and the Social Science Japan Data Archive, Information Center for Social Science Research on Japan, Institute of Social Science, the University of Tokyo. The surveys were conducted by the drop-off-pick-up method. In the 1998 survey, 10,500 individuals who were aged between 28 and 77 as of December 1998 were surveyed with a response rate of 66.52% (6,985 responses). In the 2008 survey, 9,400 individuals who were aged between 28 and 72 as of December 2008 were surveyed, and the response rate was 55.35% (5,203 responses). In our analysis, the two surveys are pooled together. One of the advantages of using the NFRJ data sets is that they contain rich information on the parents and siblings of the respondent and his/her spouse. In computing the dependency ratio, we use information on whether parents and parents-in-law are alive at the time of the respondent's marriage.

We estimate our models using data for married couples where the wife's age is 40 years or older. We further confine our sample to respondents who satisfy the following six selection criteria. First, we focus is on married respondents where the husband's age at the time of the marriage is 18 years old or older and the wife's age at the time of the marriage is 16 years old or older. This is because the Japanese legal age for marriage is 18 for men and 16 for women. Second, we only used respondents who are currently married and who have never been divorced or widowed. Divorcees or widows may have children from their previous marriage, but the NFRJ surveys do not contain information on their previous marriages. Third, we only consider households where the total number of siblings of the husband and wife is 14 or less (95% quantile). This is imposed because a few couples report a large number of siblings. Fourth, the couple has no deceased children. The existence of deceased children may mean the reported ordering of children is not necessarily the ordering when the deceased child was living. Fifth, the age of the relevant child is 20 years old or more. The conventional wisdom in Japan is that the vast majority of students will attempt to get into university over a maximum of two years after completing high school, so that by the age of 20 most Japanese will either be in an institution of higher education or working. Sixth, data on all the relevant variables must be available for the individual.

After imposing these six selection criteria, we have 2,220 observations on first children, 1,900 on second children, and 641 observations on third children. Descriptive statistics for each of these three samples are summarized in Table 1. From Table 1, we observe that, on average, educational attainment declines as the order of the child increases. That is, later child on average receive a lower level of education that an early child. This is consistent with the results obtained in previous studies.

IV. Results

All the estimated results reported in this paper were obtained using STATA Version 12 (see StataCorp, 2011). Estimates of the parameters of the ordered probit models for the first child, the second child and the third child are reported in Table 2. In each case, models are estimated for males and females together (denoted "ALL"), and for males and females separately. These estimated parameters tell us about the estimated impact of the explanatory variables on the underlying latent variable which can be interpreted as the desired level of education measured as a continuous variable, but education is only attainable in lumpy quantities which gives us the five outcomes for the ordered probit model. Here, the discussion of the estimated results should be understood as referring to how the underlying latent variable changes when an explanatory variable is changed.

According to Table 2, the effects of the expected burden of caring for aged parents are not significant in explaining the investment in education for the first child or for the second child. However, the empirical evidence suggests that an increase in the burden of caring for aged parents reduces the investment in education for the third child, especially for boys. Our findings may highlight that in order to maintain the size of the family and to cover the cost of caring for aged parents, couples with children may reduce their investments in some but not all of their children's education.

If we look at the results for ALL (both males and females), we find that females tend to have a lower level of educational achievement than males. Whether it is due to a genetic effect, an income effect, a demonstration effect, some other effect or a combination of these effects, it is also observed that parents with a higher level of education tend to have children with a higher level of education (see Tsukahara, 2007, 2009 for some related research for Japan). As is to be expected from Becker's analysis of the quantity and quality trade-off for children, an increase in the number of children in the family leads to a reduction in the average level of education of the children.

V. Conclusion

This paper examines the possibility that couples with children maintain their family size and consumption for caring for aged parents, but reduce the quality of their children. The empirical evidence indicates that increases in the burden of caring for aged parents reduces the investments in education for the third child especially for boys. Our findings may highlight that in order to maintain the size of the family and to cover the cost of caring for aged parents, couples with children may reduce their investments in some of their children's education.

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the burden of caring for aged parents reduces the investments on education for the third child especially for boys

TABLE 1: DESCRIPTIVE STATISTICS

Variable	First Child		Second Child		Third Child	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Educational attainment	3.565	1.329	3.387	1.327	3.173	1.366
Dependency_Ratio	0.462	0.232	0.464	0.229	0.458	0.223
One_parent_h (1 if only one of husband's parents is alive)	0.178	0.383	0.177	0.382	0.172	0.377
One_parent_w (1 if only one of wife's parents is alive)	0.150	0.358	0.143	0.350	0.159	0.366
Husband's age	63.087	7.396	63.268	7.317	64.275	7.473
Wife's age	60.301	6.890	60.416	6.870	61.331	7.241
Uni_h (1 if husband has a university degree or higher)	0.216	0.412	0.212	0.409	0.197	0.398
Uni_w (1 if wife has a university degree or higher)	0.046	0.209	0.043	0.202	0.031	0.174
Husband's Age at Marriage	26.956	3.434	26.801	3.303	26.378	3.269
Wife's Age at Marriage	24.167	3.211	23.948	2.968	23.432	3.015
Number of Children	2.246	0.767	2.427	0.650	3.203	0.515
Urban (1 if lives in a urban area)	0.582	0.493	0.570	0.495	0.491	0.500
1998 Survey dummy	0.591	0.492	0.586	0.493	0.596	0.491
Sample Size	2,220		1,900		641	

TABLE 2 ORDERED PROBIT RESULTS FOR EDUCATIONAL ACHIEVEMENT FOR FIRST, SECOND AND THIRD CHILDREN

	FIRST CHILD						SECOND CHILD						THIRD CHILD			
	All		Male		Female		All		Male		Female		All		Male	
Variable Name	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Dependency_Ratio	0.1271	0.1202	0.0309	0.0298	0.2206	0.2032	0.1678	0.1805	0.1142	0.1863	0.2299	0.189	-0.3026	-0.3861*	-0.4104	-0.5550**
	[0.109]	[0.112]	[0.172]	[0.181]	[0.146]	[0.148]	[0.121]	[0.126]	[0.186]	[0.193]	[0.163]	[0.168]	[0.207]	[0.211]	[0.250]	[0.265]
One_parent_h (1 if only one of husband's		-0.0348		-0.0475		-0.0464		-0.0471		0.0442		-0.1557		-0.3107**		-0.3941**
parents is alive)		[0.067]		[0.101]		[0.092]		[0.072]		[0.105]		[0.101]		[0.129]		[0.186]
One_parent_w (1 if only one of wife's		0.0149		0.0422		-0.0188		0.1063		0.1962		0.0084		0.0809		0.1072
parents is alive)		[0.068]		[0.099]		[0.098]		[0.078]		[0.122]		[0.105]		[0.125]		[0.201]
Female	-0.3177***	-0.3175***					-0.1721***	-0.1752***					-0.0946	-0.0914		
	[0.048]	[0.048]					[0.051]	[0.051]					[0.087]	[0.088]		
Husband's age	-0.0114	-0.0156	-0.051	-0.0605	0.0422	0.0381	0.2158*	0.2050*	0.1986	0.2031	0.2776*	0.2660*	0.3489*	0.3122	0.3898	0.3443
	[0.100]	[0.101]	[0.144]	[0.145]	[0.146]	[0.146]	[0.116]	[0.116]	[0.174]	[0.175]	[0.156]	[0.156]	[0.192]	[0.196]	[0.260]	[0.269]
Wife's age	0.0121	0.0164	0.0576	0.0673	-0.0495	-0.0456	-0.2092*	-0.1983*	-0.1909	-0.195	-0.2722*	-0.2612*	-0.3384*	-0.302	-0.3618	-0.3176
	[0.100]	[0.101]	[0.144]	[0.145]	[0.146]	[0.146]	[0.116]	[0.116]	[0.175]	[0.175]	[0.156]	[0.156]	[0.192]	[0.196]	[0.261]	[0.270]
Uni_h (1 if husband has a university degree	0.6684***	0.6675***	0.6757***	0.6769***	0.7270***	0.7250***	0.6288***	0.6278***	0.6050***	0.6059***	0.6889***	0.6829***	0.5982***	0.5863***	0.8859***	0.8731***
or higher)	[0.063]	[0.064]	[0.100]	[0.100]	[0.088]	[0.089]	[0.073]	[0.073]	[0.108]	[0.108]	[0.102]	[0.103]	[0.125]	[0.126]	[0.199]	[0.202]
Uni_w (1 if wife has a university degree	0.8527***	0.8532***	0.7371***	0.7359***	1.0328***	1.0343***	0.8360***	0.8351***	0.7342***	0.7396***	0.9879***	0.9892***	0.7300**	0.7304**	0.562	0.5626
or higher)	[0.172]	[0.172]	[0.257]	[0.257]	[0.241]	[0.241]	[0.168]	[0.169]	[0.255]	[0.255]	[0.232]	[0.234]	[0.343]	[0.342]	[0.446]	[0.441]
Husband's Age at Marriage	0.0381	0.0426	0.0922	0.1019	-0.0332	-0.0289	-0.2153*	-0.2040*	-0.1962	-0.2008	-0.2851*	-0.2736*	-0.3165*	-0.2764	-0.336	-0.2865
	[0.100]	[0.100]	[0.142]	[0.143]	[0.146]	[0.146]	[0.115]	[0.116]	[0.175]	[0.175]	[0.155]	[0.156]	[0.191]	[0.195]	[0.261]	[0.271]
Wife's Age at Marriage	-0.0204	-0.0248	-0.077	-0.0868	0.0528	0.0488	0.2094*	0.1982*	0.1762	0.1803	0.2972*	0.2858*	0.2985	0.2606	0.2916	0.2456
	[0.100]	[0.100]	[0.143]	[0.144]	[0.145]	[0.146]	[0.115]	[0.115]	[0.173]	[0.173]	[0.156]	[0.156]	[0.190]	[0.194]	[0.258]	[0.267]
Number of Children	-0.1595***	-0.1595***	-0.1666***	-0.1669***	-0.1521***	-0.1523***	-0.2596***	-0.2608***	-0.3475***	-0.3484***	-0.1550***	-0.1537***	-0.4843***	-0.4891***	-0.7072***	-0.7052***
	[0.034]	[0.034]	[0.047]	[0.047]	[0.048]	[0.048]	[0.042]	[0.042]	[0.060]	[0.061]	[0.058]	[0.058]	[0.093]	[0.090]	[0.139]	[0.136]
Urban (1 if lives in a urban area)	0.1047**	0.1055**	0.1158*	0.1175*	0.087	0.0866	0.1213**	0.1238**	0.1957**	0.1947**	0.0364	0.0423	0.1278	0.1509	0.0247	0.0251
	[0.050]	[0.050]	[0.070]	[0.070]	[0.072]	[0.072]	[0.053]	[0.054]	[0.077]	[0.077]	[0.076]	[0.076]	[0.093]	[0.093]	[0.134]	[0.134]
1998 Survey dummy	-0.1407***	-0.1373**	-0.0551	-0.0533	-0.2781***	-0.2674***	-0.1169**	-0.1244**	-0.0488	-0.082	-0.2034***	-0.1767**	-0.2998***	-0.2618***	-0.3297**	-0.3013**
	[0.051]	[0.054]	[0.075]	[0.079]	[0.072]	[0.075]	[0.054]	[0.057]	[0.079]	[0.084]	[0.075]	[0.078]	[0.094]	[0.101]	[0.137]	[0.144]
Sample Size	2,220	2,220	1,139	1,139	1,081	1,081	1,900	1,900	947	947	953	953	641	641	344	344

Notes:
(1) For each variable, the first number reported is the estimated coefficient (not the marginal effect), the number in square brackets is the estimated standard error, and ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.
(2) Estimates of the four cut-off and their standard errors are not reported.