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What Makes Family Members Live Apart or Together?: An Empirical Study with Japanese Panel Study of Consumers

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I examine the question of what motivates family members to live apart or together, using the Japanese Panel Study of Consumers. I attempt to explain family living arrangement by two forces, dispersing and assembling. Considering family members live together to reduce their cost of living, financial wealth functions as dispersing force, while large dwelling size works the other way. Another assembling factor is care-giving. Parents see their adult daughter as a potential caregiver while daughters expect their elderly parents to give care to their children. I find that financial wealth and large dwelling function as the most important factors for family living arrangement.

Keywords: family living arrangement, dispersing force, assembling force
JEL Classification Numbers: D19, D13

1. Introduction

Informal care to elderly parents has been traditionally placed under the responsibility of grown-up children who live with parents. In Japan, however, fewer grown-up children live with elderly parents while the number of people age 65 and older is soaring with the rapidly aging population. As a result, family care to elderly parents has continued to diminish.

This paper, based on the Japanese Panel Study of Consumers (JPSC), examines the question of what makes family members live apart or together, focusing on the relations between adult daughters and their parents who are not 65 year or older. I model that family living arrangement is determined by two opposite forces; one assembling that makes a family live together and the other dispersing that allows family members to live apart. In my model, family members have common interests in co-residence; i.e. reducing cost of living, so large dwelling size

functions as an assembling factor; high-level income, as a dispersing factor. At the same time, co-residence may serve different needs of family members. Parents see co-resident family members as a potential caregiver and daughters expect their parents to take care of their children while they work. After all, care-giving can be another assembling factor for family living arrangement.

There are many studies on family living arrangement. Kotlikoff and Morris (1990) modeled the process that an elderly parent and his or her child choose their living-arrangement. Stern (1994) demonstrated how family characteristics affect an elderly parent's choice of care arrangement. On the assumption that care-giving to elderly parents is a job for a daughter or a daughter-in-law, Wolf and Soldo (1994) and Pezzin and Schone (1999) focused on adult daughters' choice of living arrangement. While these studies underlined the role of demographic variables, only a few literatures addressed economic factors in family living arrangement. Hoerger et al. (1996) considered public subsidies as a critical determinant of how disabled elderly parents decide on their living arrangement. Miron (1996) argued that housing affordability affects on living arrangement, although the effect proved to be numerically small. Similar to Miron (1996), Costa (1997) pointed out that the Union Army Veterans who live on a pension are more likely to live separately from the younger family member.

In Japan, Iwamoto and Fukui (2001) found that income levels of children and parents are a factor of determining family living arrangement. However, the data they used do not include children's income level, thus they need to analogize children's income level out of their parents' income. Oishi and Oshio (2001) used micro data including relatively detailed information on both parents and children. Endo and Yoshida (2001) presented the evidence that elderly parents simultaneously determine their living and care arrangements.

Most prior researches, however, have flaws to work out. First, as they mainly focused on demographic variables of family members, they overlooked economic factors; i.e. housing variables and financial wealth. In fact, several studies take into consideration economic factors such as the number of rooms (Oishi and Oshio, 2001), housing prices (Hoerger et al., 1996) and dwelling sizes (Iwamoto and Fukui, 2001, Endo and Yoshida, 2001). The problem is that unlike studies on housing variables, studies on financial wealth have incoherent conclusions. That is why I address economic variables of family members in this paper. In particular, I study large dwelling size and high-income level as key factors that lead to separate living arrangement.

Second, previous researches gave attention to characteristics of parents rather than those of children. The only study using data on both sides was conducted by Oishi and Oshio (2001). Thus the correlation between child's characteristics and living arrangement remain unclear, even though child's characteristics are important determinants of family living arrangement (Kotlikoff and Morris, 1990). In this context, I focus on children's characteristics rather than those of parents. More specifically, I deal with daughters' decision of family living arrangement, given the fact that daughters (or in-law) are caregivers for parents in most families.

In addition, I found that parents in existing studies are elderly so that children's motives to live with parents remain uncertain or limited to the strategic bequest motive (Bernheim et al., 1985). However, it is possible that parents make plans for long-term care service before they need it and the plans affect their present decision on living arrangement. Hence, I assume that parents are not too old to receive care services but they have a plan for future care arrangement.

In order to verify my model, I present two empirical analyses on Japanese micro data, which contain daughters' characters and partial parent data. With one of two analyses, I prove that married daughters have different motives to live with parents from unmarried daughters. I specify two choices of family living arrangement: to live with parents or to live apart, as binary logit model.

Based on the conclusion brought by the first analysis, I use the second analysis to explain what factors influence married daughters' decision on family living arrangement. I apply multinomial logit model for three alternatives: living apart, living with parents and living with parents-in-law. In addition, IIA (Independence from Irrelevant Alternatives) assumption of this model is tested by Hausman's specification test.

This paper consists of as follows: In section 2, I construct an economic model, which is designed to draw factors making family members live apart or together. Section 3 and 4 explain data, which are employed in the empirical analyses and the econometric methodology. Results of the empirical analyses are then reported in section 5. Finally, section 6 to conclude the paper.

2. Economic Model

As did Kotlikoff and Morris (1990), I set out the model in which parents and an adult daughter decide living arrangement. Let U_C^t and U_P^t stand, respectively, for the utilities of a daughter and her parents when they live together, and U_C^a and U_P^a the utilities of them when they live apart; a daughter and her parents compare two utilities in order to decide living arrangement. If both sides think the utility of living together is greater than that of living apart, they will live together.

Suppose that (1) the utility function is of the Cobb-Douglas form and utility depends on housing service and/or care service and the amount of composite consumer good, which includes all consumer goods except housing and care services and that (2) parents own their housing stock $\bar{H}$ and have a potential demand for future long-term care service S.

In my model, when parents and a daughter live together, the situations of both sides are described with the give-and-take framework: parents give housing service and child-care service to the daughter, while they expect future elderly care from the daughter. The level of these services which are θ, t_t and $\bar{S}$ are pre-determined and both sides already know the level.

When family members live apart, parents maximize U_P^a and their daughter maximizes U_C^a. In this case, parents need to prepare their long-term care service S

while a daughter needs to purchase housing service H_C[1)].

• Parent's utility:

$$\max_{Z_p,\, S} U_P^a = \log(Z_P \bar{H} S)$$

$$subject\ to\ Y_P \geq Z_P + p_S S,$$

• Daughter's utility:

$$\max_{Z_C,\, H_C} U_C^a = \log(Z_C H_C)$$

$$subject\ to\ Y_C \equiv wt \geq Z_C + p_H H_C,$$

where Z_P and Z_C are the amount of composite consumer good for parents and their daughter, respectively. In the budget constraint, p_S stands for the market price of S; p_H, the market price of H_C. The composite consumer good is chosen as the numeraire, so its price is unity. Y_P and Y_C are the income levels of parents and their daughter, respectively, and Y_C depends on wage rate w and working hours t of a daughter.

When family members live together, they maximize U_F, which is family utility. A daughter provides parents with future care service $\bar{S}$ and in return, parents let a daughter share their house by $(1 - \theta)$ and take care of her child so that a daughter can start a job or increase her working hours by t_t. Therefore, for a daughter, the opportunity cost of future care service $\bar{S}$ is the current wage rate w of a daughter. In addition, there cannot exist the price of informal care service, so I refer to a present value of total cost for future care service as $\bar{S}$ in the joint budget constraint of family.

• Family's utility:

$$\max_{Z_p,\, Z_C} U_F = U_P^t + U_C^t = \log(Z_P \theta \bar{H} \bar{S}) + \log(Z_C (1 - \theta) \bar{H})$$

$$subject\ to\ Y_F \equiv Y_P + w(t + t_t) - \bar{S} \geq Z_P + Z_C,$$

where $\theta (0 \leq \theta \leq 1)$ is parent's share in the house.

Maximization of U_c^a and U_p^a, respectively, yields the following demand relations and indirect utility functions of parents V_P^a and daughters V_C^a.

• Parent's utility;

$$Z_P = \frac{Y_P}{2} \quad S = \frac{Y_P}{2_{PS}} \quad V_P^a = \log\left(\frac{\bar{H} Y_P^2}{4_{PS}}\right)$$

[1)] I do not take into account housing stock $\bar{H}$ in the budget constraint of parents because housing stock $\bar{H}$ do not affect their income flow. On the other hand, I include rent $p_H H_C$ among the budget constraint of child because rent $p_H H_C$ affects child's income flow.

• Daughter's utility;

$$Z_C = \frac{Y_C}{2} \quad H_C = \frac{Y_C}{2_{PH}} \quad V_C^a = \log\left(\frac{Y_C^2}{4_{PH}}\right)$$

In a similar way, the indirect utility of a family when they live together is calculated by maximization of U_F.

• Family's utility:

$$Z_P = Z_C = \frac{Y_F}{2} \quad V_F^t = V_P^t + V_C^t$$

$$V_P^t = \log\left(\frac{\theta \bar{H} Y_F \bar{S}}{2}\right)$$

$$V_C^t = \log\left(\frac{1-\theta\theta \bar{H} Y_F}{2}\right)$$

where $Y_F = Y_P + Y_C + wt_t - \bar{S}$

When they determine living arrangement, a daughter and her parents, respectively, compare indirect utilities of living together with those of living apart.

• In case $V_C^t > V_C^a$ *and* $V_P^t > V_P^a$, they live together:

$$V_C^t = \log\left(\frac{1-\theta \bar{H} Y_F}{2}\right) > V_C^a = \log\left(\frac{Y_C^2}{4_{PH}}\right) \tag{1}$$

$$V_P^t = \log\left(\frac{\theta \bar{H} Y_F \bar{S}}{2}\right) > V_P^a = \log\left(\frac{\bar{H} Y_P^2}{4_{PS}}\right) \tag{2}$$

• In case $V_C^t < V_C^a$ *or* $V_P^t < V_P^a$, they live apart.

To derive the roles of key factors, I compared indirect utilities of living together and living apart for each agent. From the comparison, I summarized the roles of key factors as follows:

1. *Financial wealth*: If either Y_P are much larger than p_S in equation (1) or Y_C much larger than p_H in equation (2), then the numerators of V_C^a or V_P^a become larger. Thus, a daughter and her parents live apart.
2. *Housing variables*: If H is large enough to accommodate a family, a daughter prefers co-residence. Because large $\bar{H}$ make V_C^t more larger than V_C^a in equation (1).
3. *Factors denoting daughters' benefits from co-residence*: If t_t is greater than zero, then family's income Y_F increase when she live with her parents. This increases V_C^t and V_P^t in equation (1) and (2), respectively. Thus, a daughter prefers co-residence.
4. *Factors denoting parents' benefits from co-residence*: If parents expect high

level of $\bar{S}$, informal care provided by daughters, V_P^I become larger in equation (2). Then parents prefer co-residence.

These predictions imply as follow:

1. *Financial wealth*: If parents or their daughter is wealthy enough to pay for the market prices of long-term care service or housing service, they have no reason to choose co-residence for scale economies.
2. *Housing variables*: Homeownership of parents increases the possibility of co-residence and that of daughters works the opposite way because daughters don't have to share parents' house. At the same time, large dwelling size increases the possibility of co-residence.
3. *Factors denoting daughters' benefits from co-residence*: When a daughter has a child or more and parents take care of her children, the larger number of children and daughters' job increase the possibility of coresidence.
4. *Factors denoting parents' benefits from co-residence*: If parents have a preference for informal care by co-resident families and their daughter has a care-giving plan, they live together.

3. The Data and Variables

I use a five-year pooled data, 1993 to 1997, drawn from The Japanese Panel Study of Consumers (JPSC), a panel data set of young married and unmarried Japanese women. From 1,500 participants in the first year, sample size of the data set diminished to 1,255 in 1997. Pooling the five-year data, the ages of respondents range from 24 to 38, and most of their parents (85%) are not aged 65 year or older.

For the binary logit model, I use the five-year pooled data which consists of 4,812 observations. Table 1 shows changes in the living arrangement of respondents for five years. Among unmarried women, the number of people living with parents decreased from 83.7% to 63.6%, as found in the third column. Percentage of the unmarried living with parents decreased from 83.7% to 63.6% during five years as found in the third column of the table. Among married women (see to the 8th column), however, the number fell by mere 2%. The findings suggest that the motives of the married to live with parents may be different from those of the unmarried.

To examine the effects of marital status, I incorporate variables for the married into explanatory variables. I design a marriage dummy that is unity in the case of the married and zero otherwise. Then, variables for the married are constructed by multiplying explanatory variables by this dummy. If the coefficients of variables for the married are statistically significant, the effects of explanatory variables are different by marital status.

Table 2 provides a list of variables and their descriptive statistics for the binary logit model. An explained variable is a dummy that is unity when a daughter lives with her parents and zero otherwise. Explanatory variables are socio-economic

Table 1 Observed frequencies of living arrangement

Year	The unmarried			The married				
	Living apart	Living together	Total	Living apart	Living together			Total
					with parents	with parents-in-law		
1993	58	297	355	578	35	146	181	759
%	16.3	83.7	100.0	76.2	4.6	19.2	23.8	100.0
1994	59	221	280	574	38	121	159	733
%	21.1	78.9	100.0	78.3	5.2	16.5	21.7	100.0
1995	56	175	231	520	28	114	142	662
%	24.2	76.8	100.0	78.5	4.2	17.2	21.5	100.0
1996	63	129	192	570	32	109	141	711
%	32.8	67.2	100.0	80.2	4.5	15.3	19.8	100.0
1997	64	112	176	451	25	92	117	568
%	36.4	63.6	100.0	79.4	4.4	16.2	20.6	100.0
Total	300	934	1234	2693	158	582	740	3433
%	24.3	75.7	100.0	78.4	4.6	17.0	21.6	100.0

characteristics of daughters, which are generally grouped into four categories: *financial wealth*, *housing variables*, *factors denoting daughters' benefits from co-residence* and *social characteristics of daughter*. The first three categories are matched with the predictions in my economic model. Since information on daughters' care-giving plan is confined to the married, factors denoting parents' benefits from co-residence are not used in the binary logit model.

For the multinomial logit model, I use the data of 1,063 married women who responded in 1993. Because only the questionnaire of the 1993 survey included questions regarding married daughters' care-giving plan. Table 3 shows a list of variables and their descriptive statistics for the multinomial logit model. Explained variables measure three choices of family living arrangements: living apart, living with parents, and living with parents-in-law. Explanatory variables are grouped into the same four categories as those of the binary logit model and plus the category of *factors denoting the parent's benefits from co-residence*. In the categories of *financial wealth* and *housing variables*, characteristics of a daughter's household, not a daughter herself, are considered. Moreover, parents' characteristics are included in the two categories while nursery-available dummy is taken into consideration in the category of the *factors denoting daughters' benefits from co-residence*.

Table 2 Descriptive statistics (binary logit model)

Variable name	Mean	s.d.††	Min	Max
Explained variable				
Co-residence dummy	0.35	0.48	0.00	1.00
Financial wealth				
Yearly income (million Yen)	1.40	1.63	0.00	13.00
Savings/securities (million Yen)	1.37	2.42	0.00	34.50
Housing variables				
Homeowner dummy	0.34	0.47	0.00	1.00
Large dwelling size				
50 m^2–69 m^2 dummy	0.18	0.38	0.00	1.00
70 m^2–99 m^2 dummy	0.17	0.38	0.00	1.00
100 m^2–149 m^2 dummy	0.21	0.40	0.00	1.00
Over 150 m^2 dummy	0.16	0.36	0.00	1.00
Factors denoting daughters' benefits from co-residence				
No. of children	1.24	1.06	0.00	5.00
Age of children†				
The first child dummy	0.36	0.48	0.00	1.00
The last child dummy	0.52	0.50	0.00	1.00
Part-time employee dummy	0.20	0.40	0.00	1.00
Full-time employee dummy	0.33	0.47	0.00	1.00
Social characteristics of daughters				
Marriage dummy	0.74	0.44	0.00	1.00
Age	30.72	3.52	24.00	38.00
Squared age	955.91	217.65	576.00	1444.00
Level of Schooling				
Vocational school graduated dummy	0.19	0.40	0.00	1.00
College graduated dummy	0.21	0.41	0.00	1.00
University graduated dummy	0.14	0.35	0.00	1.00
Eldest child dummy	0.73	0.45	0.00	1.00
13 big city dummy	0.24	0.43	0.00	1.00
Survey year dummy				
1994	0.21	0.41	0.00	1.00
1995	0.20	0.40	0.00	1.00
1996	0.19	0.39	0.00	1.00
1997	0.18	0.39	0.00	1.00

† These dummies are unity when a child is before attending elementary school and zero otherwise.
†† The s.d. is an abbreviation of standard deviation.

Table 3 Descriptive statistics (multinomial logit model)

Variable name	Mean	s.d.‡‡	Min	Max
Explained variable				
Living apart dummy	0.75	0.43	0.00	1.00
Co-residence dummy (parent)	0.05	0.22	0.00	1.00
Co-residence dummy (parent-in-law)	0.20	0.40	0.00	1.00
Financial wealth				
Daughter's household				
Yearly income (million Yen)	5.72	2.29	0.00	25.20
Savings/securities (million Yen)	3.06	3.76	0.00	34.00
Parents				
5 million–10 million income dummy	0.31	0.46	0.00	1.00
Over 10 million income dummy	0.12	0.32	0.00	1.00
Parents-in-law				
5 million–10 million income dummy	0.29	0.46	0.00	1.00
Over 10 million income dummy	0.10	0.30	0.00	1.00
Housing variables				
Homeowner dummy				
Daughter or/and her husband	0.32	0.47	0.00	1.00
Parents	0.45	0.50	0.00	1.00
Parents-in-law	0.55	0.50	0.00	1.00
Large dwelling size				
50 m^2–69 m^2 dummy	0.20	0.40	0.00	1.00
70 m^2–99 m^2 dummy	0.14	0.35	0.00	1.00
100 m^2–149 m^2 dummy	0.16	0.37	0.00	1.00
Over 150 m^2 dummy	0.11	0.32	0.00	1.00
Factors denoting daughters' benefits from co-residence				
No. of children	1.63	0.89	0.00	5.00
Age of children†				
The last child dummy	0.76	0.43	0.00	1.00
Part-time employee dummy	0.19	0.40	0.00	1.00
Full-time employee dummy	0.16	0.37	0.00	1.00
Nursery-available dummy††	0.21	0.41	0.00	1.00
Factors denoting parents (or parents-in-law)' benefits from co-residence				
Daughters' caregiving plan dummy				
To parents	0.60	0.49	0.00	1.00
To parents-in-law	0.57	0.49	0.00	1.00
Social characteristics of daughters				
Age	30.38	3.25	24.00	37.00
Level of Schooling				
University graduated dummy	0.10	0.29	0.00	1.00
Eldest child dummy	0.72	0.45	0.00	1.00
13 big city dummy	0.25	0.43	0.00	1.00

† This dummy are unity when the last child is before attending elementary school and zero otherwise.

†† Nursery-available dummy is unity when a daughter can find a nursery school without difficulty in her place of residence and zero otherwise.

‡‡ The s.d. is an abbreviation of standard deviation.

4. Empirical Model

4.1. Binary Logit Model

Let i (i = 1, ..., N)th daughter have two choices, living with parents or living apart, based on the value of LA_i. The value of LA_i is determined as follows:

$$\begin{array}{ll} LA_i = 1 & \text{if } V_C^t - V_C^a > 0 \text{ living with parents} \\ LA_i = 0 & \text{otherwise} \qquad \text{living apart} \end{array}$$

The probability for ith daughter to choose living with parents is,

$$Prob(LA_i = 1) = \frac{\exp(X_i\beta)}{1 + \exp(X_i\beta)}$$

where X_i represents socio-economic characteristics of the ith daughter. To compare the effects of explanatory variables, I calculate marginal effects from β. I use the sample average of the marginal effects at every observation X_i.

$$\frac{\partial Prob(\,LA_i = 1\,)}{\partial X_i} = \frac{\exp(X_i\beta)}{(1 + \exp(X_i\beta))^2}\beta$$

4.2. Multinomial Logit Model

Unlike the unmarried, married women have three choices of living arrangement: living apart, living with parents or living with parents-in-law. Let LA_{ij} be "satisfaction" of the i pair of a daughter and her parents when they choose j (j = 1, 2, 3)th choice of living arrangements, then they decide living arrangement by comparing LA_{i1}, LA_{i2} and LA_{i3}. LA_{ij} is defined as below:

$$\begin{array}{ll} LA_i = j & \text{if } j \text{ is chosen} \\ = 0 & \text{otherwise} \end{array}$$

The possibility of each choice is written in terms of the difference from the first choice which is living apart.

$$Pr(LA_i = 1) = \frac{1}{1 + \exp(Z_i\beta_2) + \exp(Z_i\beta_3)}$$

$$Pr(LA_i = j\,) = \frac{\exp(Z_i\beta_j)}{1 + \exp(Z_i\beta_j) + \exp(Z_i\beta_j)} \quad (j = 2, 3)$$

where Z_i represents socio-economic characteristics of ith daughter and her household and economic characteristics of parents. As it is in the binary logit model, the coefficient β_j is not associated with the marginal effect of Z_i on the jth probability. The marginal effects can be computed from β_j, but there is at least some potential for confusion: the marginal effects need not have the same sign as the estimates.

Thus, I deal with sign and significance of β_j.

Moreover, Oishi and Oshio (2001) estimated the multinomial logit model. In their model, the validity of IIA assumption is not proved so that there seems to exist the correlation between two choices: living with parents and living with parents-in-law. If these two choices are correlated, the following nested logit model need to be used.

$$Pr(LA_i = 1) = \frac{1}{1 + [\exp(\rho^{-1} Z_i \beta_2) + \exp(\rho^{-1} Z_i \beta_3)]^{\rho}}$$

$$Pr(LA_i = j | LA_i \neq 1) = \frac{\exp(\rho^{-1} Z_i \beta_j)}{\exp(\rho^{-1} Z_i \beta_2) + \exp(\rho^{-1} Z_i \beta_3)}$$

If $\rho = 1 (0 \leq \rho \leq 1)$, these probabilities become equal to those of the multinomial logit model.

In order to prove the validity of IIA assumption, I conduct two types of Hausman's specification tests. First, I eliminate the third choice, living with parents-in-law, from the choice set and estimate a model with two choices. Since 20% of the respondents chose the choice, I lose 20% of observations. To compare the coefficients estimated by the multinomial logit model with those estimated by the two-choice model, I calculate a statistic as follows:

$$\chi^2 = (\beta_s - \beta_f)'(Var_s - Var_f)^{-1}(\beta_s - \beta_f)$$

where s indicates the estimators based on the restricted subset, f the estimators based on the full set of choices, and Var_s and Var_f are the respective estimates of the asymptotic covariance matrices.

Second, I compared the results of the nested logit model with those of the multinomial logit model. A statistic is

$$\chi^2 = (\beta_N - \beta_M)'(Var_N - Var_M)^{-1}(\beta_N - \beta_M)$$

where N indicates the estimators by the nested logit model and M the estimators by the multinomial logit model.

These statistics are used to test two null hypotheses. The first null hypothesis is that two groups of coefficients estimated by the model with two choices and the multinomial logit model, are consistent, but the coefficients estimated by the two-choice model is inefficient. The second null hypothesis is that two groups of coefficients estimated by the nested logit model and the multinomial logit model, are consistent, but the coefficients estimated by the nested logit model is inefficient.

5. Estimation Results

5.1. Binary Logit Analysis

Table 4 reports the estimation results of the binary logit model. Marginal effects of the coefficients are also provided in Table 5.

Table 4 Estimates of binary logit model

Parameter	The unmarried			The effect of marital status		
	Estimate	s.e.†	P-value	Estimate	s.e.†	P-value
Constant	6.06	9.77	0.54	–9.51	10.82	0.39
Financial wealth						
Yearly income (million Yen)	–0.44	0.13	0.00	0.64	0.14	0.00
Savings/securities (million Yen)	0.26	0.06	0.00	–0.35	0.06	0.00
Housing variables						
Homeowner dummy	–5.76	0.48	0.00	3.33	0.50	0.00
Large dwelling size						
50 m^2–69 m^2 dummy	2.69	0.34	0.00	–1.82	0.42	0.00
70 m^2–99 m^2 dummy	4.50	0.43	0.00	–1.72	0.48	0.00
100 m^2–149 m^2 dummy	5.73	0.49	0.00	–1.37	0.54	0.00
Over 150 m^2 dummy	5.13	0.53	0.00	–0.19	0.57	0.74
Factors denoting daughters' benefits from co-residence						
No. of children	–1.00	0.34	0.01	1.19	0.34	0.00
Age of children						
The first child dummy	0.01	0.41	0.99	0.23	0.46	0.62
The last child dummy	–2.44	0.82	0.01	2.58	0.84	0.00
Part-time employee dummy	–1.03	0.70	0.15	1.49	0.72	0.05
Full-time employee dummy	–0.52	0.67	0.45	1.06	0.71	0.15
Social characteristics of daughters						
Age	–0.19	0.66	0.78	0.15	0.72	0.84
Squared age	0.00	0.01	0.94	0.00	0.01	0.98
Level of Schooling						
Vocational school graduated dummy	–0.91	0.32	0.01	0.39	0.36	0.29
College graduated dummy	–0.27	0.37	0.47	–0.07	0.41	0.87
University graduated dummy	–0.78	0.36	0.04	–0.90	0.43	0.05
Eldest child dummy	0.73	0.28	0.01	–0.63	0.30	0.05
13 big city dummy	–0.71	0.26	0.01	0.62	0.30	0.05
Survey year dummy						
1994	–0.42	0.40	0.31	0.32	0.46	0.49
1995	–0.63	0.48	0.20	0.17	0.55	0.76
1996	–0.89	0.49	0.08	0.31	0.55	0.58
1997	–0.87	0.48	0.08	0.22	0.54	0.69
Pseudo-R^2	0.69					

† The s.e. is an abbreviation of standard error.

Table 5 Marginal effects of binary logit model

Parameter	The unmarried			The effect of marital status		
	Estimate	s.e.†	P-value	Estimate	s.e.†	P-value
Constant						
Financial wealth						
Yearly income (million Yen)	–0.04	0.25	0.13	0.06	0.03	0.05
Savings/securities (million Yen)	0.02	0.01	0.08	–0.03	0.01	0.03
Housing variables						
Homeowner dummy	–0.51	0.10	0.00	0.32	0.10	0.00
Large dwelling size						
50 m^2–69 m^2 dummy	0.24	0.08	0.01	–0.18	0.09	0.07
70 m^2–99 m^2 dummy	0.40	0.10	0.00	–0.17	0.11	0.14
100 m^2–149 m^2 dummy	0.50	0.11	0.00	–0.13	0.12	0.28
Over 150 m^2 dummy	0.45	0.12	0.00	–0.02	0.14	0.90
Factors denoting daughters' benefits from co-residence						
No. of children	–0.09	0.05	0.11	0.12	0.04	0.01
Age of children						
The first child dummy	0.00	0.10	0.99	0.02	0.11	0.85
The last child dummy	–0.21	0.15	0.16	0.25	0.13	0.06
Part-time employee dummy	–0.09	0.16	0.58	0.14	0.16	0.38
Full-time employee dummy	–0.05	0.16	0.78	0.10	0.16	0.54
Social characteristics of daughters						
Age	–0.02	0.01	0.16	0.01	0.03	0.57
Squared age	0.00	0.00	0.96	0.00	0.00	0.99
Schooling level						
Vocational school graduated dummy	–0.08	0.07	0.29	0.04	0.09	0.67
College graduated dummy	–0.02	0.09	0.79	–0.01	0.10	0.95
University graduated dummy	–0.07	0.09	0.43	–0.09	0.10	0.41
Eldest child dummy	0.06	0.05	0.24	–0.06	0.06	0.33
13 big city dummy	–0.06	0.06	0.32	0.06	0.07	0.41
Survey year dummy						
1994	–0.04	0.10	0.71	0.03	0.11	0.78
1995	–0.06	0.11	0.63	0.02	0.14	0.90
1996	–0.08	0.11	0.50	0.03	0.14	0.83
1997	–0.08	0.10	0.50	0.02	0.13	0.88

† The s.e. is an abbreviation of standard error.

Financial wealth[2)]

Yearly income and *savings/securities* represent daughter's financial wealth, which are related to the first prediction in my economic model. For the unmarried, the coefficient of *yearly income* is significantly negative, which is in consistent with my model. In the meantime, *savings/securities* has a significant positive coefficient. However, I find that the negative marginal effect of *yearly income* is larger than the unexpected positive marginal effect of *savings/securities*. Thus, financial wealth of daughters decreases the probability of co-residence.

Housing variables[3)]

To prove the second prediction in the economic model, *homeowner dummy* and *large dwelling size* dummies are used for the estimation. *Homeowner dummy* has a significant negative coefficient, but *large dwelling size* dummies significant positive coefficients. That is, those daughters who live in large dwelling or do not own their dwelling are more likely to live with parent. The results are in accord with the second prediction in my economic model. In particular, *housing variables*' marginal effects has the largest sum among the explanatory variables,

[2)] Saving level and living arrangements might be determined simultaneously. To investigate whether saving level has an endogenous effect on living arrangements, I choose respondents who change their living arrangements and calculated increase or decrease of saving level for each year.

Period	Living apart → Living together	Living together → Living apart	No change
Year1 → Year2	–85.3	–231.3	154.1
95% confidence interval	–1335.0~1164.4	–610.7~148.1	76.4~231.8
Year2 → Year3	45.6	–660.7	101.3
95% confidence interval	–156.5~247.7	–1016.6~–304.8	32.6~170.1
Year3 → Year4	312.9	–490.0	75.9
95% confidence interval	–109.1~734.9	–909.0~–71.0	–25.7~177.5
Year4 → Year5	–37.9	–325.0	21.2
95% confidence interval	–530.3~454.5	–880.1~230.2	–60.3~102.7

Thousand Yen

If saving level has an endogenous effect, the saving level of daughters who change their living arrangements from living apart to living together should increase. As shown in the above table, however, it is not clear that the saving level increased between each period. In contrast, the saving level of those who change their living arrangements in the opposite directions decreased in two periods of year2~year3 and year3~year4. Given that the saving level of those who do not change their living arrangements increased in two periods of year1~year2 and year2~year3, the decreases mean that the change from living together to living apart costs a lot of money. Hence I assume that saving level affects the decision of living arrangements, but living arrangement has no effect on the saving level.

which indicates that *housing variables* are the most important factors for daughters to consider in deciding their living arrangement.

Factors denoting daughters' benefits from co-residence

The effects of *factors denoting the daughter's benefits from co-residence* are associated with the third prediction in the economic model. *No. of children, age of children* and *part-time employee dummy* have significant coefficients and their negative sings, which go against to the third prediction. However, given that daughters who have a child or more enjoy the benefits and that 33% of respondents have no children, however, the unexpected signs cannot be explained in the framework of the third prediction. Hence, I will verify the prediction for the married later.

Social characteristics of daughters

Two high *level of schooling* dummies have significant negative signs, but *eldest child dummy* has a significant positive coefficient. The results imply that high level of schooling reduces the probability of co-residence, but the probability rises in case a daughter is the eldest child of her parent. As for *13 big city dummy*, its coefficient may have two interpretations depending on its sign: First, daughters live with parent to reduce the cost of living, because living in a big city requires high living cost. Second, daughters live alone because of their high earnings. Thus, the negative coefficient of *13 big city dummy* show that the second interpretation is true in the case of the unmarried.

[3)] Housing variables and living arrangements might be determined simultaneously. To investigate whether housing variables have an endogenous effect on living arrangements, I conducted conditional fixed-effects logistic regression for the binary logit model where the explained variables are zero if a daughter lives apart or unity otherwise. In the case of the multinomial logit model, dynamic analyses cannot be applied because only the 1993 survey data is employed in the model. For the housing variables, the results of conditional fixed-effects logistic regression are as follows:

Parameter	Estimate	s.e.	P-value
Housing variables			
Homeowner dummy	–3.33	0.41	0.00
Large dwelling size			
50 m^2–69 m^2 dummy	2.04	0.53	0.00
70 m^2–99 m^2 dummy	3.22	0.56	0.00
100 m^2–149 m^2 dummy	5.02	0.66	0.00
Over 150 m^2 dummy	5.19	0.67	0.00

Like the coefficients of binary logit analysis in Table 4, *homeowner dummy* has a significant negative coefficient and *large dwelling size dummies* have significant positive coefficients. Hence the second prediction in the economic model is still available in the results of dynamic analysis.

The effect of marital status

The coefficients of *financial wealth* variables are all significant and show opposite signs, compared to the unmarred case. The negative coefficient of *savings/securities* coincides with the first prediction of the economic model while the positive sign of *yearly income* does not. In case a daughter is married, however, her household's economic characteristics are more likely to affect her decision on living arrangement than her own economic characteristics do. Thus, the role of *yearly income* need to be discussed in the multinomial logit model using household data. The coefficients of *housing variables* are also opposite to those in the unmarried case, but the overall effects on the married (the coefficients of the unmarried + the coefficients of the effect of marriage) are the same as that on the unmarried. Hence, marriage weakens the effects of *housing variables*, but does not change the signs of the effects. Unlike the unmarried, the coefficients of *factors denoting daughters' benefits from co-residence* variables have significantly positive signs, thereby verifying the third prediction.

5.2. Multinomial Logit Analysis

I conducted two types of IIA test. Both tests show that the null hypotheses can not be rejected at 90 percent significance level. Hence, the IIA assumption of my model is proved; the estimated coefficients of the model are not only consistent but also efficient. The estimation results are provided in Table 6.

Financial wealth

The coefficients of all *yearly income* are significantly negative, which is in accord with the first prediction in the economic model. Unlike *yearly income*, *savings/securities* has a significantly positive coefficient in the case of living with parents-in-law. As one possible explanation of the positive sign, *savings/securities* may be inherited from her parents-in-law.

Housing variables

As expected in the economic model, *homeowner dummy* of daughter or/and her husband has a significantly negative coefficients, while those of parents and parents-in-law have significantly positive coefficients. The coefficients of *large dwelling size* dummies are all significantly positive. The results indicate that those daughters who live in larger dwelling, do not own their dwelling, or whose parents (or parents-in-law) own dwelling are more likely to live with parents (or parents-in-law). Furthermore, if parents own house, daughters' probability of living with parents-in-law decreases and vice versa.

Factors denoting daughters' benefits from co-residence

The coefficient of *nursery available dummy* is significantly negative only in the case of living with parents-in-law, thus living with parents-in-law may be substitute for a nursery school. Moreover, the coefficients of *age of children, part-time or full-time employee dummies* are significantly positive in the case of living with

Table 6 Estimates of multinomial logit model

Parameter	Living with parents			Living with parents-in-law		
	Estimate	s.e.†	P-value	Estimate	s.e.†	P-value
Constant	–4.55	0.11	0.00	–3.03	0.13	0.00
Financial wealth						
Daughter's household						
Yearly income (million Yen)	–0.24	0.08	0.01	–0.11	0.05	0.04
Savings/securities (million Yen)	0.04	0.05	0.44	0.09	0.05	0.09
Parent						
5 million–10 million income dummy	–1.45	0.08	0.00	0.35	0.07	0.00
Over 10 million income dummy	–1.42	0.06	0.00	0.37	0.08	0.00
Parent-in-law						
5 million–10 million income dummy	–0.24	0.13	0.07	–1.37	0.08	0.00
Over 10 million income dummy	0.50	0.07	0.00	–1.82	0.14	0.00
Housing variables						
Homeowner dummy						
Daughter or/and her husband	–1.59	0.27	0.00	–2.71	0.17	0.00
Parent	1.57	0.12	0.00	–21.06	0.06	0.00
Parent-in-law	–4.08	0.08	0.00	1.24	0.11	0.00
Large dwelling size						
50 m^2–69 m^2 dummy	0.74	0.15	0.00	1.75	0.17	0.00
70 m^2–99 m^2 dummy	1.92	0.30	0.00	3.74	0.17	0.00
100 m^2–149 m^2 dummy	2.55	0.29	0.00	4.81	0.18	0.00
Over 150 m^2 dummy	4.60	0.41	0.00	6.19	0.25	0.00
Factors denoting daughters' benefits from co-residence						
No. of children	–0.13	0.11	0.22	0.03	0.12	0.83
Age of children						
The last child dummy	–0.20	0.11	0.08	0.29	0.08	0.00
Part-time employee dummy	–0.12	0.22	0.60	0.51	0.10	0.00
Full-time employee dummy	0.18	0.15	0.24	1.81	0.07	0.00
Nursery dummy	0.04	0.11	0.69	–0.32	0.08	0.00
Factors denoting parents (or parents-in-law)' benefits from co-residence						
Daughters' caregiving plan dummy						
To parent	1.05	0.08	0.00	0.18	0.07	0.02
To parent-in-law	–0.53	0.09	0.00	0.54	0.07	0.00
Social characteristics of daughters						
Age	0.09	0.01	0.00	–0.01	0.01	0.51
Level of schooling						
University graduated dummy	–15.90	0.06	0.00	–1.65	0.07	0.00
Eldest child dummy	–0.18	0.10	0.07	–0.07	0.07	0.33
13 big city dummy	0.33	0.18	0.07	0.27	0.12	0.03
Pseudo-R^2	0.61					

† The s.e. is an abbreviation of standard error.

parents-in-law as expected in the economic model. Compared the results of the binary logit model, this result supports the third prediction of the economic model. In other words, married daughters are more sensitive to the benefits from co-residence than single daughters are.

Factors denoting parents (or parents-in-law)' benefits from co-residence

In accordance with the fourth prediction in the economic model, daughter's care-giving plan for parents results to living with parents[4]. Daughter's care-giving plan also increases the probability of living with parents-in-law, while plan for parents-in-law decreases the probability of living with parents. The result indicates that those daughters who have a plan to take care of both sides of parents are more likely to live with parents-in-law.

Social characteristics of daughters

Referring to the variables about daughter's social characteristics, the coefficients have the same significant signs to those of the binary logit model.

6. Conclusion

In this paper, I examined the question of what motivates family members to live apart or together, using the JPSC. I attempted to explain family living arrangement by two forces, dispersing and assembling. Considering family members live together to reduce their cost of living, financial wealth functions as a dispersing force, while large dwelling size works the other way. Another assembling factor is care-giving. Parents see their adult daughter as a potential care-provider while daughters expect their elderly parents to give care to their children. Based on these assumptions, I set out four predictions about the determinants of family living arrangement.

1. High income will make family members live apart.
2. Large dwelling size and parents' homeownership will let family members living together, while daughters' homeownership will result in living in a separate quarter.
3. If daughters have children and parents take care of them, daughters' job will increase the chance of co-residence.
4. Daughters who have a care-giving plan for their parents will be more likely to live with parents.

The binary logit model, in which only daughters' data are used, demonstrates

[4] In the data used in this paper, "daughters' care-giving plan dummy" is the only variable that gives information about long-term care for parents. The dummy is unity if a daughter has a care-giving plan for parents and zero otherwise. Even though the dummy variable is an answer to the question about only a daughter's plan, the variable may be interpreted as the results of an implicit contract between parents and their daughter about long-term care service in the future.

that daughters' motives of co-residence are different according to marital status. The model also proves the first and the second predictions by showing that yearly income and housing variables are key determinant for the unmarried.

As for the married, the multinomial logit model verifies that lower income level, larger dwelling size, parents' homeownership, daughters' job, and care-giving plan for parents are the motives for co-residence, thereby showing the validity of my predictions. The result of IIA test shows that it is no evidence that two types of co-residence are correlated.

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