NBER WORKING PAPER SERIES

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Working Paper No. 5033

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 1995

The author is grateful to Robert Pollak and Mark Rosenzweig for useful discussions. The research reported here was supported by grants from the National Science Foundation and the National Institute of Aging. All the computations using Japanese data were done while my affiliation was with Osaka University. This paper is part of NBER's research programs in Aging and Economic Fluctuations. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

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ABSTRACT

Altruism has the well-known neutrality implication that the family's demand for commodities is invariant to the division of resources within the family. We test this by estimating Engel curves on a cross-section of Japanese extended families forming two-generation households. We find that the pattern of food expenditure is significantly affected by the division of resources. The food components whose budget share increases with the older generation's share of household income are precisely those favored by the old such as cereal, seafood, and vegetables.

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1. Introduction

In the standard model of the family, all members of the family jointly maximize a common objective function. This is because members are altruistic to each other, or because of the Rotten Kid Theorem of Becker (1991) that selfish members find it to their self interest to subscribe to the altruist's objective. The model has the strong neutrality implication that the family's demand for each commodity is invariant to the division of resources within the family as long as total family resources are controlled for.

The existing literature has examined this demand neutrality with respect to the division of resources between the husband and wife.[1] The purpose of this paper is to test inter-generational altruism by studying the division of resources between the parent and adult child. As in Bourguignon *et. al.* (1991a,b), we test demand neutrality by estimating Engel curves on cross-section data. The advantage of the use of Engel curves is that the effect of the family's total resources on demand is accounted for by total expenditure.

The data we use came from a random cross-section sample of Japanese households. The Japanese data provide an attractive setting for testing inter-generational altruism for three reasons. First, a large fraction of the cross-section of households is extended families forming two-generation households. Second, as shown below, there is a sharp generational difference in food tastes, so that if neutrality is false and the division of resources matters, the pattern of the household's food expenditure should be tilted toward the direction favored by the wealthier generation. Third, if there are altruistic parent-child pairs, we would expect to find them in two-generation households.

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1. See, *e.g.*, Cai (1989), Schultz (1990), Thomas (1990), Bourguignon, Browning, Chiappori, and Lechene (1991a,b). See Behrman (1992) for a survey.

The organization of the paper is as follows. Section 2 is a brief description of the data. In Section 3, after showing from the sample of nuclear households that there is a sharp generational difference in food tastes, we test demand neutrality for two-generation households by checking whether the older generation's share of household income has a significant effect when included in Engel curves. Section 4 states conclusions.

2. The Data

The data came from the 1984 survey of the *National Survey of Family Income and Expenditure*, a series of cross-section surveys conducted by the Japanese government every five years since 1959.[2] The survey of about fifty-five thousand households includes information on expenditure on hundreds of items over a three-month period, income over a 12-month period to the survey, and assets. Each income component (*e.g.*, employment income, pension income, interest and dividend income) is broken down by household member, but the breakdown is rather coarse: "head", "spouse", and "all other household members".

An important fact about Japanese households is the prevalence of extended families in the form of two-generation households. Define an *adult* as an individual who is either working, 25 years or older, married, or the head of a singles household, and a *generation* as either an unmarried adult or a married couple, with or without its non-adult co-residing children. A *two-generation household* is a household of two related generations and a *nuclear household* is a household of one generation. Our definition of a two-generation household, which implies that there be no other adults besides the two related generations, is dictated

2. See Hayashi, Ando and Ferris (1988) for a detailed description and evaluation of the data. We will also present results from the 1979 survey at the end of the paper.

by our desire to identify each generation's income despite the coarse breakdown of household income by member mentioned above.[3] The data contain 32,266 nuclear and 13,820 two-generation households. See Appendix for more details on the construction of the sample.

Sample means of selected variables are displayed in Table 1. The following are noteworthy. First, there is a scarcity of old nuclear households (see line 2), a reflection of the fact, documented in more detail in Hayashi, Ando, and Ferris (1988) using the same data, that the majority of the elderly live with their children. Second, for both young and old generations, income is lower for those co-residing (see line 9).[4] This, together with the fact (not reported in the Table) that the older generation's income is *negatively* correlated with the younger generation's in the sample of two-generation households, suggests that co-residence is an "inferior good" chosen by parents and their adult children whose joint income is relatively low.

Third, there is a sharp generational difference in the pattern of food expenditure between young and old nuclear households. The young spend a higher fraction of food budget on meat & dairy products and eating out while the old favor more traditional items such as cereal, seafood, and vegetables. Of course this can be due to differences in the family structure (*e.g.*, the number of non-adult children) and income level. We will show in the next section that, except for meat & dairies, the sharp generational difference remains even after controlling for those other factors. The food expenditure pattern of two-

3. If there were other adults in the household, the non-head generation's income, which we take to be the income of "all other household members", would include their income as well.

4. This is true for couples as well as singles for any age brackets (see Hayashi *et. al.* (1988)).

generation households lies between those two contrasting patterns.[5] Whether this intermediate pattern is entirely due to the mere co-existence of two generations or is also due to the intra-household division of resources is the issue to be examined in the next section.

3. Testing Neutrality

3.1. Specification of Engel Curves

In order to implement the test of demand neutrality, we need to address four issues on the specification of Engel curves. The first issue is treatment of durables. Total consumption expenditure in Engel curves includes service flows from durables. But there is evidence from a separate Japanese micro data that all commodities except food are (psychologically) durable.[6] For such commodities it is impossible to calculate service flows because there is no information on cumulative expenditures. We avoid this difficulty by making the assumption (to be tested below) that food is *weakly separable* from other commodities (except leisure, see the next paragraph) and focus on the allocation of food expenditure among food components.

The second issue is treatment of hours worked. Lacking information on hours worked and wage rates, we are too constrained to provide a completely satisfactory treatment here. Since available evidence (see Browning and Meghir (1991) for the U.K.) is that non-durables are not weakly separable from leisure, we condition food demand on hours worked by including (proxies of) hours worked in Engel curves, as in Browning and

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5. The budget share of meat & dairies is higher than that for young nuclear households. One explanation is that consumption of meat & dairies for the young takes place at restaurants rather than at home.

6. Hayashi's (1985) estimate of the depreciation rate for recreational expenditure, for example, is 5%.

Meghir. Then the issue is whether hours worked included in Engel curves are correlated with the error term. Since we do not have valid instruments such as wage rates and education in our data, *we are forced to make an untestable assumption that hours worked in Engel curves are exogenous* (i.e., uncorrelated with the error term). Furthermore, hours worked are proxied by dummy variables for full- and part-time work.

Third, food expenditure is an endogenous variable. We instrument it by the household's income, capital income, and net financial assets. Under the maintained hypothesis of exogenous hours worked, both capital income and labor income (which is part of income) are valid instruments.

Fourth, we have to deal with the possible sample selection bias. Since the distribution of unobservable taste shifters entering Engel curves as the error term for two-generation households is already conditional on co-residence, the error term may be correlated with instruments (*e.g.*, income) that affect the residence status choice. Correcting for the bias is very difficult. The standard Heckit procedure is not feasible here because our sample of nuclear households are not linked by relation, providing no information on the characteristics of parent-adult child pairs that have chosen not to co-reside. Thus *we ignore the sample selection bias*. This is less onerous than it sounds, since the Engel curves we estimate are in the budget share form and are only a sub-system of demand functions.[7] Also, if the error term in Engel curves is measurement error, no bias arises.

3.2. Engel Curves for Nuclear Households

Before proceeding to test demand neutrality, we document that there is a sharp

7. An earlier version of this paper (Hayashi (1993)) has a example in which the motive for co-residence is to exploit the public good nature of housing and in which no sample selection bias arises.

generational difference in food tastes by estimating Engel curves for nuclear households. The form of the Engel curves we use relates budget shares to the log of food expenditure:[8]

$$s_j = z'\alpha_j + \beta_j \log(x) + \varepsilon_j \quad \text{for the j-th food component,} \tag{3.1}$$

where x is food expenditure for the household in question, z is a vector of demographics and employment status, s_j is the budget share of the j-th food component, and ε_j is the error term. As in Table 1, we divide food into the six components. We assume that the error term is conditionally homoskedastic because parameter estimates under conditional heteroskedasticity are very similar. Then, since both the instruments and the right-hand-side variables are the same across equations, the three-stage least squares reduces to the two-stage least squares.

Table 2 reports results from the two-stage least squares estimation of the Engel curves for nuclear households.[9] The budget share of eating out is strongly influenced by marital status, the wife's employment status, and the existence of non-adult children. The full- and part-time work dummies seem to capture the effect of hours worked reasonably well, with their coefficients generally of the same sign and the full-time dummy having a larger effect. More importantly, the adult's age affects budget shares very strongly, as indicated by the age dummy coefficients. The base for the age dummies is the age bracket of less than 35 years, so, for example, the coefficient of 3.3 for the 55-65 age bracket for cereal means that the budget share for those between 55 and 65 is higher than those under

8. This is the functional form implied by the Translog model of Christensen, Jorgenson, and Lau (1975) and the Almost Identical Demand System of Deaton and Muelbauer (1980). We also estimated in Hayashi (1993) the functional form implied by quasi-homothetic preferences (where log(x) is replaced by 1/x) and quadratic Engel curves (where log(x) is replaced by x), with very similar results.

9. The sixth food component, other food, is dropped because budget shares add up to one.

age 35 by 3.3 percentage points on average. The pattern of the age dummy coefficients indicates that food taste evolves relatively rapidly until age 55 to 65. The old spend more on cereal, seafood, and vegetables, and less on eating out, while the budget share of meat & dairies is age-neutral. Thus the apparent generational difference for meat & dairies in Table 1 is due to demographics other than age.

In sum, despite a strong sign of mis-specification (see the large Sargan statistic for orthogonality of instruments) our estimation of Engel curves for nuclear households has served our purpose: it unambiguously confirms the sharp generational difference in food tastes.

3.3. Augmented Engel Curves for Two-generation Households

We now turn to the sample of two-generation households to test demand neutrality. We use the same budget share form of the Engel curves (3.1), with the z vector now including demographics and employment statuses of two generations. Under the null of demand neutrality, demographics, hours worked, and total (food) expenditure for the household as a whole are the only determinants of the household's demand. Thus, if the Engel curves are augmented to include an indicator of the intra-household division of resources, the indicator should not be significant in the *augmented Engel curves*. The indicator of intra-household division of resources we use is the older generation's share of household income. Under the maintained hypothesis of exogenous hours worked, the old's income share can be treated as exogenous. Thus the set of instruments for the augmented Engel curves is: demographics and employment statuses of two generations, household income, capital income, net financial assets, and the old's share of household income.

This test has power against at least some alternatives. Consider, for example, the alternative hypothesis of no sharing of resources between the two co-residing generations. To make the point, temporarily ignore demographics and hours worked and assume that each generation's Engel curves are given by:

$$(3.2) \qquad s_j^g = \alpha_j^g + \beta_j \log(x^g) + \varepsilon_j^g \quad (g = p \text{ for parents, } p = k \text{ for adult children}),$$

where s_j^g is the budget share of the j-th food component in generation g's own food budget x^g. The generational difference in food tastes is captured by $\alpha_j^p - \alpha_j^k$. If $\lambda = x^p/(x^p + x^k)$ is the older generation's share of the household's food expenditure, the budget share, s_j, of the j-th food component for the two-generation household as a whole implied by (3.2) is

$$(3.3) \qquad s_j = \alpha_j^k + \beta_j \log(x^p + x^k) + (\alpha_j^p - \alpha_j^k)\lambda + \lambda \log(\lambda) + (1 - \lambda)\log(1 - \lambda) + \varepsilon_j,$$

where $\varepsilon_j = \lambda\varepsilon_j^p + (1 - \lambda)\varepsilon_j^k$. Thus, budget shares depend not only on the household's food expenditure $x^p + x^k$ but also on the old's *expenditure* share (λ) which, although unobservable, must be positively correlated with the old's *income* share, since food is a normal good. So the old's income share in the augmented Engel curves should be significant under the alternative of no sharing. Its coefficient would be larger, the larger the generational difference $\alpha_j^p - \alpha_j^k$ and the tighter the correlation between the old's income share and the old's expenditure share.

Table 3 reports the two-stage least squares estimation of the augmented Engel curves for two-generation households. The parameter estimates inherit the pattern of the work dummy coefficients we noted for nuclear households. But more importantly, the large Wald statistic for the null hypothesis that the coefficient of the old's income share is zero in the system of five Engel curves implies that demand neutrality can be rejected decisively.

Furthermore, the pattern of the old's income share coefficients matches closely the age effect shown in Table 2 for nuclear households. As the old's income share rises, the budget share rises precisely for food components favored by the old and falls for those favored by the young. This effect is largest for eating out, where the generational difference is the sharpest, and is insignificant for meat & dairies which we found to be age-neutral.

Given the rejection of the null hypothesis of demand neutrality, it is not surprising that the Sargan statistic is significant. Under the alternative of no sharing, for example, the augmented Engel curves are a mis-specified model of the budget shares.

3.4. Additional Results for Two-generation Households

If food is not weakly separable from other commodities (except leisure), the expenditure in Engel curves should be over a larger set of commodities, and the old's income share may be picking up the effect of commodities that should have been included. To address this, we add to the augmented Engel curves the log of medical expenditure and treat it as endogenous.[10] The Wald statistic for the joint significance of medical expenditure in the system, reported in Row 2 of Table 4, shows no strong sign of a failure of weak separability. The old's income share remains highly significant with an equivalent t-value of 7.8.

As pointed out by a referee, current earnings of the old may be correlated with the health of the old. If health affects the pattern or the amount of the old's food consumption, the old's share of household income can be significant in the augmented Engel curves. The use of capital income in place of (total) income would resolve this difficulty, but capital

10. We also tried non-durables expenditure, but because of severe multi-collinearity parameter estimates were imprecise and the test was inconclusive.

income in the present data is very poorly measured.[11] Instead, we continue to use the old's share of income (which includes pension and social security benefits) but restrict the sample to those households whose older generation does not work. The relevant Wald statistic for the joint significance of the old's income share is in Row 3. The sample size is less than a half, but the old's income share remains highly significant.

Another possibility is that the variations in hours worked not captured by the full- and part-time dummies are being picked up by the current earnings component of income. In Row 4, we further restrict the sample of retired parents to those in which neither member of the younger generation works part-time. The Wald statistic barely changes.

It may appear that the main source of the rejection is the very sharp generational difference for eating out. In Row 5, we eliminate eating out from food expenditure and focus on the four components of food at home. The rejection remains strong. It is not reported in the Table, but the close match between the age effect for nuclear households and the pattern of the old's income share coefficients for two-generation households also holds for the components of food at home. For the old's favorites (cereal, seafood, and vegetables), their budget share rises with the old's income share, while for meat & dairies, which as a component of food at home is now favored by young nuclear households, the budget share falls with the old's income share.

Finally, the last two columns of Table 4 show that results are almost the same for the separate cross-section data from the 1979 survey, which makes the rejection of demand neutrality even more compelling.

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11. Capital income is zero for 80% of the older generations and 79% of the younger generations in the sample of two-generation households. Household capital income is zero for 65% of the sample. This is true despite the fact that 80% of the sample reports positive net financial assets.

4. Conclusion

A hallmark of altruism is the neutrality property that demand is invariant to the division of resources within the family. When applied to extended families forming two-generation households, it implies that demand should be invariant to the old generation's share of household income, the implication strongly rejected in this paper. Furthermore, the effect of the old's income share has the pattern predicted by the alternative of a lack of full sharing of resources between two co-residing generations. If there are altruistic parent-adult child pairs, we would expect to find them in two-generation households. It is significant that we were able to reject altruism for such households. Evidence against altruism presented in this paper for Japan and in Altonji, Hayashi, and Kotlikoff (1992) for the U.S. casts serious doubts on the empirical basis for the view that generations act as if they form a single immortal dynasty.

Appendix: Derivation of the Sample

Since a description of the data used in this study can be found in Hayashi *et. al.* (1988), this appendix focuses on the derivation of the samples used for analysis from raw data. Figure 1 is a succinct summary of the derivation. The exclusion of missing cases involves elimination of households with missing values for relevant variables and those that do not have record for all three months (September- November) of the survey. (This latter criterion does not apply to the singles in the 1984 survey because they were surveyed for only one month.) For the 1984 survey, the 47,393 non-single households can be divided into three subsets — non-single nuclears, two-generation households, and others — according to the definition of nuclear and two-generation households given in the text. The set of other households includes three-generation households or two-generation households in which more than one adult children work, for example. For the 1979 survey, there are 35 non-single households whose head and spouse are of the same sex. After eliminating those households, we apply the definition of nuclear and two-generation households to produce final samples.

References

Altonji, J., F. Hayashi, and L. Kotlikoff (1992) "Is the Extended Family Altruistically Linked? Direct Tests using Micro Data", *American Economic Review* **82**, pp. 1177-1198.

Becker (1991) *A Treatise on the Family*, 2nd ed., Harvard University Press, Cambridge, Mass.

Behrman, J. (1992) "Intrahousehold Distribution and the Family", mimeo., University of Pennsylvania.

Bourguignon, R., M. Browning, P. Chiappori, and V. Lechene (1991a), "Intrahousehold Allocation of Consumption: Some Evidence from French Data", mimeo., DELTA.

Bourguignon, R., M. Browning, P. Chiappori, and V. Lechene (1991b), "Intrahousehold Allocation of Consumption: Some Evidence from Canadian Data", mimeo, DELTA.

Browning, M. and C. Meghir (1991) "The Effects of Male and Female Labor Supply on Commodity Demands", *Econometrica* **59**, pp. 925-952.

Christensen, L., D. Jorgenson, and L. Lau (1975) "Transcendental Logarithmic Utility Functions", *American Economic Review* **65**, pp. 367-383.

Cai, J. (1989) "Are Husbands and Wives Altruistically Linked? Evidence from the Micro Data", mimeo., Boston University.

Deaton, A. and J. Muelbauer (1980) *Economics and Consumer Behavior*, Cambridge University Press.

Hayashi, F. (1985) "Permanent Income Hypothesis and Consumption Durability: Analysis based on Japanese Panel Data", *Quarterly Journal of Economics* **90**, pp. 895-916.

Hayashi, F., A. Ando and R. Ferris (1988) "Life Cycle and Bequest Saving: A Study of Japanese and U.S. Households Based on the 1984 NSFIE Data and Data from the Survey of Consumer Finances", *Journal of the Japanese and International Economies* **2**, pp. 450-491.

Hayashi, F. (1993) "Is the Japanese Extended Family Altruistically Linked? A Test based on Engel Curves", Center on Japanese Economy and Business Discussion Paper No. 80, Columbia University.

Schultz, T. (1990) "Testing Neoclassical Model of Family Labor Supply and Fertility", *Journal of Human Resources* **15**, pp. 599-634.

Thomas, D. (1990) "Intra-Household Resource Allocation: An Inferential Approach", *Journal of Human Resources* **15**, pp. 635-664.

TABLE 1

SIMPLE STATISTICS BY HOUSEHOLD TYPE

	household type			
	young nuclear (age < 55)	old nuclear (55 ≤ age)	two-generation	
			younger generation	older generation
1. sample size	26,498	5,768	13,820	
2. population estimate (millions)	20.5	5.1	8.5	
3. age of the generation	36.3	64.1	34.5	63.6
4. #adults	1.74	1.57	1.61	1.59
5. #non-adult children	1.27	0.04	1.10	0.15
6. %couples	73.6%	56.5%	61.4%	58.9%
7. %single male	15.9%	8.0%	19.4%	5.6%
8. %single female	10.5%	35.5%	19.1%	35.5%
9. annual income	443.6	307.0	343.0	262.2
10. total consumption expenditure	277.2	198.9	341.4	
11. food	79.5	47.6	90.7	
12. %budget share, cereal	10.6%	13.9%	12.8%	
13. %budget share, seafood	11.3%	18.6%	17.3%	
14. %budget share, meat & dairies	14.5%	12.5%	17.4%	
15. %budget share, vegetables	15.8%	24.3%	19.3%	
16. %budget share, eatout	34.2%	16.9%	17.9%	
17. %budget share, other	13.5%	13.8%	15.3%	

Note to Table 1: Weighted means are calculated as follows. Let w_i be the sampling weight for observation i available from the survey. Because our sample excludes missing cases, the weight must be inflated so that the sample mean is unbiased for the population mean. The inflation factor is given by $x/(y \times z)$ where x = the number of families in the population, y = sample size after elimination of missing cases, and z = sample average of w_i. For singles, x = 7.243 million, y = 3,924. For non-singles, x = 30.095 million, y = 47,393. So, for example, the sum of the inflated w_i over the sample is the estimate of the number of families in the population. The population estimate relative to the sample size is larger for nuclear families because singles are sampled much less frequently than non-singles.

The age of a generation is the age of the individual if the generation is an individual and the average age if the generation is a couple. Income does not include private transfers. Income is for the 12-month period ending in November 1984, while total consumption expenditure and food expenditure are over the 3 month period (September-November) at annual rates in ten thousand yen. A generation's income is the sum of husband's and wife's income if the generation is a couple. If the generation is an individual, its income is the individual's income. The definition of food components is as follows: cereal = rice, bread, noodles, flour and other cereals; sea food = fish and shellfish; meat & dairies = meat, dairy products and eggs; vegetables = vegetables and fruits; eatout = cooked food and restaurant expenditure; other = oil, sweets, beverages, excluding tobacco and alcohol.

TABLE 2

BUDGET SHARE EQUATIONS: NUCLEAR HOUSEHOLDS (32,266 HOUSEHOLDS)

Right-hand-side Variables	Cereal		Seafood		Meat & Dairies		Vegetables		Eatout	
Age distribution of non-adult children										
#children, $0 \leq$ age < 5	1.8	(20)	0.2	(3)	2.3	(30)	0.1	(1)	−6.8	(41)
#children, $5 \leq$ age < 10	2.5	(28)	−0.3	(4)	0.4	(5)	−0.3	(4)	−4.0	(24)
#children, $10 \leq$ age < 15	3.4	(33)	−0.5	(5)	1.0	(11)	−0.8	(8)	−4.6	(24)
#children, $15 \leq$ age < 20	3.9	(33)	−0.2	(2)	2.0	(19)	−0.8	(8)	−6.4	(29)
#children, $20 \leq$ age < 25	2.7	(12)	−0.7	(3)	1.5	(8)	−0.9	(5)	−3.7	(9)
Marital status dummies										
head is single male	−8.3	(43)	−9.4	(55)	−12.8	(78)	−13.8	(81)	54.1	(155)
head is single female	−8.7	(29)	−2.7	(10)	−4.0	(16)	−0.7	(3)	20.7	(38)
Work dummies										
husband works full-time	−2.4	(13)	1.4	(9)	0.8	(5)	−0.6	(4)	1.4	(4)
husband works part-time	−0.5	(1)	0.3	(0)	−0.1	(0)	−0.5	(1)	0.7	(1)
wife works full-time	−1.2	(12)	0.2	(3)	−1.1	(13)	−1.4	(17)	3.7	(22)
wife works part-time	0.1	(0)	−0.2	(1)	−1.2	(10)	−0.8	(7)	2.5	(10)
Age dummies										
$35 \leq$ age < 45	2.5	(19)	3.1	(27)	−0.0	(0)	3.0	(25)	−8.1	(34)
$45 \leq$ age < 55	4.0	(26)	5.3	(39)	−0.0	(0)	5.0	(37)	−13.3	(48)
$55 \leq$ age < 65	3.3	(20)	7.9	(53)	−0.2	(2)	6.8	(46)	−16.7	(55)
$65 \leq$ age < 75	3.1	(14)	8.8	(43)	−0.6	(3)	8.3	(41)	−18.2	(44)
$75 \leq$ age	3.4	(8)	8.9	(23)	0.8	(2)	9.9	(26)	−20.8	(26)
log(food)	−9.9	(26)	−1.9	(5)	0.8	(3)	−0.3	(1)	17.0	(25)
mean of dependent variable (%)	12.2		13.8		16.0		18.4		24.9	
standard deviation (%)	7.3		7.4		7.5		7.6		20.5	
residual standard deviation (%)	6.9		6.2		5.9		6.1		12.5	
Sargan statistic:	$\chi^2(10) = 78.4$ (p-value $= 1.0 \times 10^{-12}$) [equiv. t-value = 7.1]									

Note to Table 2: Absolute values of t-ratios in parentheses. Food is treated as endogenous, instrumented by household income, capital income, and net financial assets. Other right hand variables included are: the constant, eight regional and four city-size dummies. The Sargan statistic for the system is calculated as: $e'(S^{-1} \otimes X(X'X)^{-1}X)e$ where $e' = (e_1', \ldots, e_5')$, e_j is the residual vector from the j-th equation, X is the matrix of instruments, and S is the 5×5 residual covariance matrix. The degrees of freedom are 10 because the number of instruments exceeds that of the right-hand-side variables by 2 in each equation.

TABLE 3

TEST OF DEMAND NEUTRALITY (13,820 TWO-GENERATION HOUSEHOLDS)

Right-hand-side Variables	Cereal	Seafood	Meat & Dairies	Vegetables	Eatout
Dummies for Younger Generation					
single male	0.8 (2.5)	−2.3 (8.1)	−1.7 (7.3)	0.2 (0.8)	5.0 (11.3)
single female	−0.2 (0.4)	−3.4 (7.1)	−0.3 (0.6)	1.3 (3.1)	4.8 (6.4)
husband works full-time	−1.3 (2.6)	−0.1 (0.2)	1.5 (4.0)	−1.1 (3.0)	1.8 (2.6)
husband works part-time	−1.4 (1.3)	−0.8 (0.9)	1.8 (2.1)	−0.3 (0.3)	2.6 (1.7)
wife works full-time	−1.3 (7.8)	0.5 (3.2)	−0.5 (3.7)	−0.9 (6.8)	2.0 (8.4)
wife works part-time	−0.0 (0.0)	−0.1 (0.4)	−0.9 (3.7)	−1.0 (4.0)	2.1 (4.8)
Dummies for Older Generation					
single male	−0.8 (2.6)	−2.2 (7.8)	−0.3 (1.4)	−0.4 (1.6)	4.2 (9.3)
single female	−1.2 (5.6)	−1.8 (9.3)	−0.3 (1.8)	0.3 (1.9)	3.7 (12.4)
husband works full-time	−1.9 (8.6)	1.2 (6.1)	1.0 (5.6)	−0.6 (3.4)	−0.1 (0.4)
husband works part time	−0.4 (0.5)	1.2 (1.5)	−0.7 (1.0)	0.4 (0.6)	0.1 (0.1)
wife works full-time	−2.0 (11.5)	0.3 (1.8)	0.2 (1.8)	−0.8 (6.0)	1.8 (7.4)
wife works part-time	−0.1 (0.2)	−0.2 (0.5)	0.2 (0.7)	−0.9 (3.0)	0.3 (0.6)
log(food)	−5.4 (9.5)	−3.5 (6.9)	−0.7 (1.5)	0.3 (0.7)	15.4 (19.2)
the old's income share	1.9 (5.9)	0.8 (2.8)	−0.2 (0.8)	1.2 (4.8)	−3.3 (7.3)
mean of dependent variable (%)	12.7	17.5	17.5	19.1	17.7
standard deviation (%)	7.8	7.4	6.5	6.3	11.1
residual standard deviation (%)	7.8	6.9	5.8	5.8	10.8

Wald statistic for the joint significance of the old's income share: $\chi^2(5) = 82.3$ (p-value $= 2.7\times10^{-16}$) [equiv. t-value = 8.2]

Sargan statistic: $\chi^2(10) = 41.3$ (p-value $= 1.0\times10^{-5}$) [equiv. t-value = 4.4]

Note to Table 3: Absolute values of t-ratios in parentheses. Other right-hand-side variables are: the constant, eight regional dummies, four city-size dummies, age distribution over five age brackets (0-4, 5-9, 10-14, 15-19, 20-24) of the younger generation's non-adult children, age distribution over five age brackets of the older generation's non-adult children, and age dummies for the two generations. The means of the dependent variables slightly differ from those in Table 1 because here observations are not weighted. For a very few cases (0.06% of the sample) in which income is zero for both generations, the old's income share is set to 1/2.

TABLE 4

ADDITIONAL RESULTS FOR TWO-GENERATION HOUSEHOLDS

	Specification	1984 Survey		1979 Survey	
		Sample Size	Wald Statistic	Sample Size	Wald Statistic
1	Base case: Engel curves augmented by the old's income share; five food components (cereal, seafood, meat & dairies, vegetables, eatout)	13,820	$\chi^2(5) = 82.3$ $p = 2.7\times10^{-26}$ equiv. $t = 8.2$	11,918	$\chi^2(5) = 92.7$ $p = 1.9\times10^{-18}$ equiv. $t = 8.8$
2	Log medical expenditure added to augmented Engel curves; Wald statistic on joint significance of medical expenditure	13,820	$\chi^2(5) = 14.2$ $p = 1.5\times10^{-2}$ equiv. $t = 2.4$	11,918	$\chi^2(5) = 17.9$ $p = 3.0\times10^{-3}$ equiv. $t = 3.0$
3	The base case; Sub-sample: parents do not work	6,357	$\chi^2(5) = 28.5$ $p = 2.9\times10^{-5}$ equiv. $t = 4.2$	6,566	$\chi^2(5) = 45.5$ $p = 1.2\times10^{-8}$ equiv. $t = 5.7$
4	The base case; Sub-sample: parents do not work, adult children do not work part-time.	5,799	$\chi^2(5) = 27.2$ $p = 5.2\times10^{-5}$ equiv. $t = 4.0$	6,105	$\chi^2(5) = 48.7$ $p = 2.5\times10^{-9}$ equiv. $t = 6.0$
5	Exclude eating out from food expenditure and estimate augmented Engel curves for four food components	13,820	$\chi^2(4) = 46.9$ $p = 1.6\times10^{-9}$ equiv. $t = 6.0$	11,918	$\chi^2(4) = 43.7$ $p = 9.8\times10^{-9}$ equiv. $t = 5.7$

Note to Table 4: In Row 2, the Wald statistic is for the joint significance of the log of medical expenditure in the augmented Engel curves. In all other rows, the Wald statistic is for the joint significance of the old's income share.

FIGURE 1

DERIVATION OF SAMPLES: 1984 SURVEY

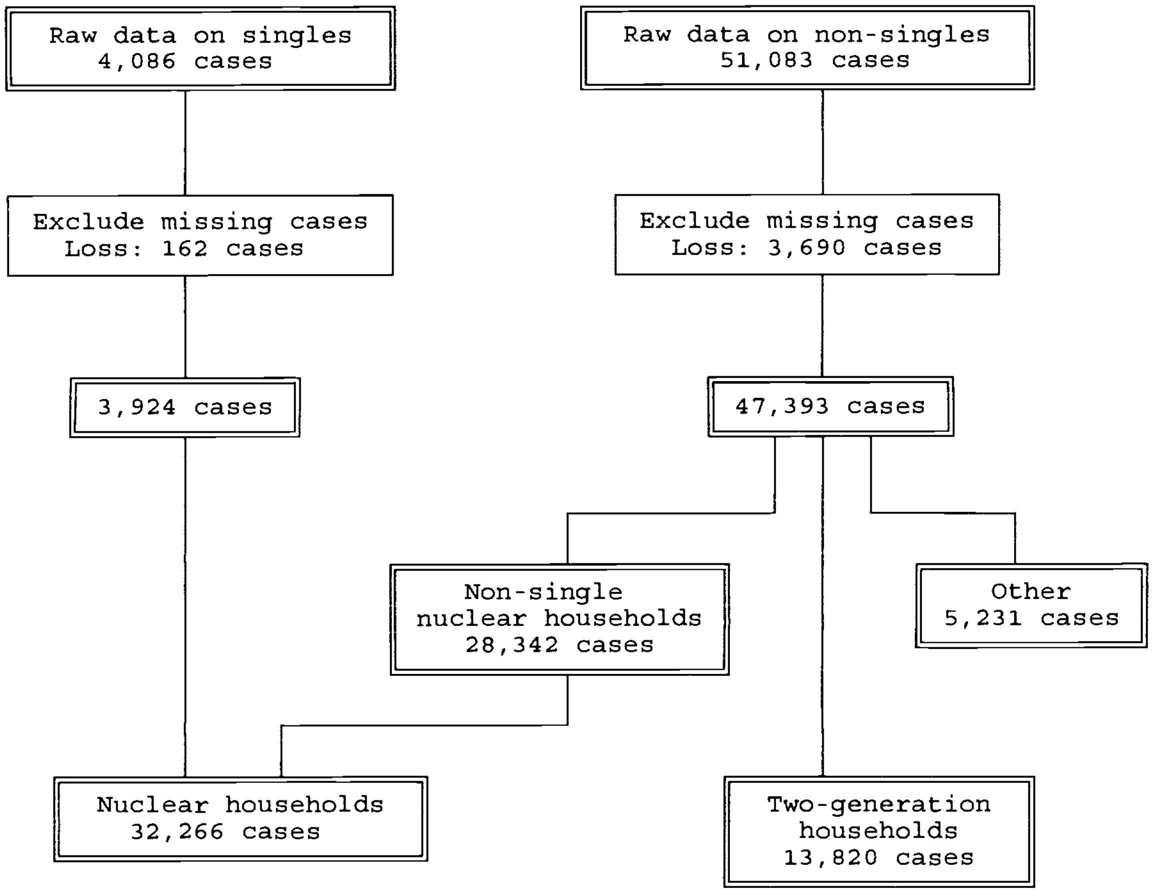

FIGURE 1 (CONTINUED)

DERIVATION OF SAMPLES: 1979 SURVEY