Volume Title: Aging Issues in the United States and Japan

Volume Author/Editor: Seiritsu Ogura, Toshiaki Tachibanaki and David A. Wise, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-62081-6

Volume URL: http://www.nber.org/books/ogur01-1

Publication Date: January 2001

Chapter Title: An Empirical Investigation of Intergenerational Consumption Distribution: A Comparison among Japan, the United States, and the United Kingdom

Chapter Author: Makoto Saito

Chapter URL: http://www.nber.org/chapters/c10287

Chapter pages in book: (p. 135 - 168)

4

An Empirical Investigation of Intergenerational Consumption Distribution

A Comparison among Japan, the United States, and the United Kingdom

Makoto Saito

4.1 Introduction

When evaluating economic growth, it is fundamentally important to recognize not only what constitutes rapid growth, but also how the results of that growth are distributed between generations. When an economy grows rapidly, public transfers from the young or middle-aged to the elderly often are justified on the grounds that the elderly devoted their youth to the growing economy and thus should be rewarded financially in their twilight years. For this reason, intergenerational transfer schemes have been implemented in most developed countries.

However, the implications of recent population aging and slow economic growth are causing concern in regard to the consequences of these intergenerational transfers. That is, there are serious questions about the validity of existing social welfare programs that tend to favor the elderly excessively. These social welfare programs will have their costs passed on to the younger generation, and this trend may continue for future generations. Such concerns are especially important in Japan, where the population is aging the most quickly among all industrial countries.

This paper empirically analyzes how the results of successful economic growth have been distributed among generations during the past thirty years in Japan, the United States, and the United Kingdom. These three countries provide a controlled experiment for evaluating the consequences of intergenerational transfers on the wealth distribution. In comparison with both Japan and the United States, the United Kingdom is relatively free from any negative effects of intergenerational transfer schemes, for the

Makoto Saito is professor of economics at Hitotsubashi University.

following reasons: First, no large-scale public pension system was implemented in the United Kingdom. The existing public pension system is therefore not as generous as those found in the other two countries, and is more a flat-rate scheme. Although an earnings-related element (the State Earnings-Related Pension Scheme) was introduced to the United Kingdom by the 1975 Social Security Pension Act, this was scaled down in the 1986 Social Security Act.[1]

Second, although there was a population increase immediately after World War II in the United Kingdom, it was not as great as the baby boom phenomenon experienced in Japan and the United States. A more even distribution of population alleviates some potential problems associated with intergenerational transfers. Finally, the United Kingdom has not experienced a major slowdown in economic growth for the past thirty years mainly because of its poor economic performance in the 1960s. Levels of social security benefits, which might have been determined initially under optimistic growth expectations, would be politically difficult to modify later. Therefore, serious economic slowdown indeed may cause financial problems under a pay-as-you-go pension system. Without a major slowdown in the economy, the United Kingdom has been free of such problems.

For these three reasons, the United Kingdom is less subject to the negative effects of intergenerational transfers than is either Japan or the United States. Hence, if there were any difference in the intergenerational wealth distribution between Japan and the United Kingdom or between the United States and the United Kingdom, it would be because of cross-country differences in the size and impact of public intergenerational transfer schemes.

The first half of this paper examines how the cross-sectional distribution of consumption goods between elderly and young consumers has evolved over time. Using age-classified consumption data, I find that in both Japan and the United States, the percentage of youth consumption has declined substantially on a per capita basis while elderly consumption has increased dramatically. By contrast, young consumers in the United Kingdom are receiving an increasingly greater percentage of consumption goods. As discussed above, the observed pattern of consumption distribution in both Japan and the United States suggests that resources are transferred publicly on a large scale from the young or middle-aged to elderly consumers.

In the second half of the paper, I present an analytical framework for evaluating quantitatively the evolution of the cross-age distribution of consumption goods (Saito 1997). The framework treats this evolution as if the observed cross-age distribution were along a general equilibrium path with spot markets as well as future markets. This method can be used to analyze

1. See Atkinson (1995) for a detailed discussion of the development of state pensions in the United Kingdom.

the change in the distribution of cross-age consumption patterns into two distinct effects: (a) the *age effect,* or the effect of the difference in the age consumption pattern (e.g., the middle-aged consume more than the elderly); and (b) the *cohort effect,* or the effect arising from differences in lifetime income among cohorts (e.g., the elderly currently receive higher lifetime income as a result of the implementation of welfare programs).

This framework allows for a theoretical interpretation of the observed evolution of the cross-age distribution of consumption goods and allows us to evaluate a lifetime income relative to resource availability on a cohort-by-cohort basis. Applying this method to the age-classified data, I find that the value of the lifetime income peaked for the cohort born between 1932 and 1936 in Japan and for the American cohort born between 1947 and 1951. In both countries, lifetime income has declined among younger cohorts. This deterioration in lifetime income is more serious in the United States than in Japan, however. By contrast, the value of lifetime income is higher for younger cohorts in the United Kingdom.

Since the real price per unit of consumption goods has decreased because of economic growth, a resulting decrease in the value of lifetime income does not necessarily imply a decline in the living standard. My calculation suggests, however, that without sound economic growth, the living standard of future generations may be unsustainable under existing welfare programs in the United States.

This paper is organized as follows: Section 4.2 describes how the cross-age distribution of consumption goods has evolved in Japan, the United States, and the United Kingdom. Section 4.3 presents an analytical framework for quantitatively evaluating the age-classified consumption data, and derives a set of empirical predictions. Section 4.4 applies this framework to the age-classified consumption data of Japan, the United States, and the United Kingdom. Section 4.5 concludes.

4.2 The Evolution of the Cross-Age Consumption Distribution

4.2.1 Data

In this section, I examine how the consumption goods generated by economic growth have been allocated among the different age groups, and then compare the evolution of the cross-age consumption distribution in the three countries. Research on consumption distribution is important, in that the level of consumption better indicates the level of economic welfare of a household than do such other variables as disposable income. In the next section, I give a rigorous theoretical interpretation to this evolution of the cross-age consumption distribution.

The data used in this research include household surveys summarized according to the age of the household head. This type of household data

is considerably easier to obtain than household microdata; government agencies from many countries, including the three studied here, regularly publish summarized data sets. Using the successive years of the cross-age household survey data, I construct a consumption and expenditure cohort data set, with data indexed by both date of birth and age of household head.

The Japanese data come from the National Survey on Family Income and Expenditure (NSFIE). This survey has been conducted every five years since 1959, has collected data on more than 40,000 households, and is the most representative among Japanese government household surveys. I use the age-classified consumption and expenditure data taken from 1959 to 1994.[2] There are two categories of household in this survey: one headed by a worker (hereafter, workers' households); and another, including household heads who are self employed (hereafter, all households). Expenditure items are reported for both categories while income items are reported for the former only.

I use U.S. data from the Consumer Expenditure Survey (CES), which has been conducted annually since 1980, collecting between 5,700 and 8,300 observations. Other similar surveys were carried out in 1972–73 and 1960–61. I use the 1980–94 surveys as well as the 1972–73 versions of the CES.

The British data come from the Family Expenditure Survey (FES). This annual survey has been conducted since 1954 and collects information from approximately 7,000 households annually. I use the official British 1971–91 summarized versions of the FES for this research.

One conceptual problem with the above-mentioned summarized data sets is that consumption and income data are both measured at the household level. In other words, the data indexed by the age of the household head include the consumption of other household members of different ages. To overcome this problem, household expenditures must be allocated to individual household members (Gokhale, Kotlikoff, and Sabelhaus 1996). Another solution would be to control for the effect of household consumption attributable to multiple members of the household by using an adult equivalence scale (Deaton and Paxson 1994). Both research methods require detailed information about the household composition, which is available only from microdata. The data sets I use do not provide such detailed information. This is particularly the case with the NSFIE summarized tables, where only the size of the household is recorded. For this reason, I use per-member consumption indexed by the age of the household head as a first approximation.

Another concern is that total consumption may include medical and

2. The 1969 survey report does not include the age-classified consumption and expenditure data.

educational expenditures, the age consumption patterns of which have changed dramatically over the past three decades. Therefore, I report the results based not only on total consumption, but also on food/clothes consumption patterns, which have not changed substantially.

4.2.2 The Cross-Age Consumption Distribution

Tables 4.1–4.4 show annual relative consumption patterns. In all these tables, the consumption of the young and the elderly is compared with that of the middle-aged (which includes those aged forty). These tables illustrate the evolution of the cross-age consumption distribution, thus indicating whether consumption has increased or decreased within an age group.

Table 4.1 shows that elderly consumption among Japanese workers' households has increased considerably compared to middle-aged consumption. For example, the ratio of total consumption for those aged fifty to fifty-four increased from 1.18 in 1959 to 1.51 in 1994. This pattern is also observed in food and clothes consumption. Further, relative food consumption by youth has decreased more than the relative food consumption by the middle-aged; the ratio for those aged twenty-five to twenty-nine declined from 1.03 in 1959 to 0.88 in 1994. Even if the self-employed are included in the household category, these cross-age patterns do not change substantially (table 4.2).

Table 4.3 illustrates the cross-age consumption distribution in the United States. Youth consumption here has increased more slowly for both the total and the food/clothes categories. For example, the ratio of total consumption for those aged twenty-five to thirty-four decreased from 1.16 in 1972–73 to 0.93 in 1994. Consumption by the elderly, especially for those in their late sixties and seventies, has increased considerably since 1980. This observation from household data is similar to the findings of Gokhale, Kotlikoff, and Sabelhaus (1996) drawn from individual consumption data.

Table 4.4 illustrates the evolution of the consumption distribution in the United Kingdom. The relative ratio of youth total consumption has been stable since the early 1970s. For those aged fifty to sixty-four, on the other hand, consumption grew at a slower rate in total and for food/clothes; for total consumption, the ratio declined from 1.38 in 1971 to 1.26 in 1991.

These tables illustrate a striking contrast between Japan and the United Kingdom and between the United States and the United Kingdom. In both Japan and the United States, the results of economic growth have been distributed more to the elderly and less to the youth on a per capita consumption basis. In the United Kingdom, the fruits of economic growth have been distributed more to the young or middle-aged populations.

As discussed in the introduction, the cause of this striking difference may lie in the extent to which implementation of social security schemes has affected intergenerational wealth distribution. That is, economic

Table 4.1 **Relative Per-Member Consumption in Workers' Households in Japan**

	−24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–; 65–69	70–; 70–74	75–
						A. Total Consumption						
1959	0.95	1.09	0.99	0.99	1.00	1.07	1.18	1.15	1.18	1.04		
1964	1.05	1.08	0.98	0.98	1.00	1.11	1.23	1.22	1.11	1.21		
1974	1.13	1.06	0.95	0.93	1.00	1.17	1.28	1.28	1.20	1.08		
1979	1.13	1.06	0.94	0.93	1.00	1.22	1.45	1.42	1.34	1.30		
1984	1.11	1.09	0.93	0.93	1.00	1.20	1.46	1.53	1.48	1.42	1.38	1.57
1989	1.12	1.07	0.97	0.91	1.00	1.25	1.48	1.56	1.49	1.44	1.51	1.23
1994	1.02	1.11	1.01	0.94	1.00	1.27	1.51	1.60	1.56	1.58	1.49	
						B. Food Consumption						
1959	1.01	1.03	0.98	0.99	1.00	1.01	1.07	1.07	1.13	1.04		
1964	0.98	1.03	0.98	0.99	1.00	1.03	1.07	1.07	1.06	1.14		
1974	1.05	0.99	0.93	0.95	1.00	1.05	1.07	1.08	1.06	1.09		
1979	0.95	0.95	0.89	0.94	1.00	1.07	1.11	1.10	1.15	1.13		
1984	0.92	0.91	0.86	0.91	1.00	1.05	1.09	1.12	1.13	1.18	1.21	1.15
1989	0.85	0.86	0.86	0.90	1.00	1.07	1.12	1.18	1.22	1.24	1.34	1.25
1994	0.81	0.88	0.87	0.91	1.00	1.09	1.17	1.23	1.30	1.39	1.37	
						C. Clothes Consumption						
1959	0.91	1.13	1.02	1.02	1.00	1.09	1.42	1.17	1.22	1.14		
1964	1.07	1.06	1.01	0.99	1.00	1.18	1.33	1.29	1.02	1.07		
1974	1.09	1.01	0.87	0.89	1.00	1.24	1.36	1.27	1.15	0.90		
1979	1.26	1.01	0.90	0.89	1.00	1.31	1.56	1.58	1.50	1.24		
1984	1.22	1.10	0.90	0.89	1.00	1.22	1.57	1.73	1.53	1.66	1.65	1.40
1989	1.09	1.04	0.98	0.89	1.00	1.20	1.42	1.67	1.47	1.42	1.36	1.19
1994	0.92	1.09	1.01	0.97	1.00	1.21	1.49	1.62	1.61	1.59	1.42	

Source: National Survey on Family Income and Expenditure (1959–94).

Table 4.2 **Relative Per-Member Consumption in All Households in Japan**

	−24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–; 65–69	70–; 70–74	75–
						A. Total Consumption						
1964	1.01	1.04	0.96	0.96	1.00	1.08	1.13	1.11	1.03	1.01		
1974	1.15	1.05	0.94	0.92	1.00	1.16	1.20	1.18	1.07	0.93		
1979	1.13	1.05	0.93	0.92	1.00	1.20	1.40	1.33	1.21	1.10		
1984	1.14	1.09	0.94	0.92	1.00	1.18	1.35	1.34	1.24	1.13	1.08	1.03
1989	1.13	1.08	0.97	0.91	1.00	1.24	1.43	1.44	1.32	1.24	1.18	1.13
1994	1.01	1.11	1.00	0.93	1.00	1.25	1.46	1.51	1.42	1.36	1.32	1.21
						B. Food Consumption						
1964	0.96	1.01	0.97	0.98	1.00	1.02	1.03	1.02	1.03	1.00		
1974	1.04	0.98	0.93	0.94	1.00	1.04	1.04	1.06	1.02	0.98		
1979	0.94	0.92	0.88	0.93	1.00	1.06	1.09	1.09	1.07	1.03		
1984	0.93	0.91	0.87	0.91	1.00	1.04	1.05	1.01	1.00	1.00	0.50	0.96
1989	0.86	0.87	0.86	0.90	1.00	1.07	1.10	1.14	1.13	1.10	1.09	1.05
1994	0.80	0.87	0.87	0.90	1.00	1.09	1.16	1.20	1.23	1.25	1.24	1.19
						C. Clothes Consumption						
1964	1.01	0.97	0.94	0.95	1.00	1.09	1.15	1.13	0.99	0.88		
1974	1.09	0.97	0.86	0.87	1.00	1.20	1.24	1.20	1.02	0.82		
1979	1.16	0.95	0.87	0.89	1.00	1.30	1.51	1.51	1.29	1.02		
1984	1.23	1.07	0.88	0.88	1.00	1.20	1.46	1.43	1.27	1.16	0.98	0.89
1989	1.08	1.02	0.98	0.89	1.00	1.22	1.45	1.55	1.24	1.15	1.06	1.05
1994	0.90	1.08	0.99	0.97	1.00	1.23	1.47	1.55	1.51	1.32	1.16	0.92

Source: National Survey on Family Income and Expenditure (1959–94).

Table 4.3 **Relative Per-Member Consumption in U.S. Households**

	−24	25–34	35–44	45–54	55–64	65–	65–74	75–
				A. Total Consumption				
1972–73	1.45	1.16	1.00	1.23	1.40	1.17		
1980–81	1.06	1.10	1.00	1.16	1.25	1.09		
1982–83	0.93	1.03	1.00	1.11	1.17	1.05		
1984	0.90	0.96	1.00	1.12	1.13	0.95	1.00	0.84
1985	0.88	0.99	1.00	1.15	1.19	1.00	1.03	0.93
1986	0.86	0.93	1.00	1.21	1.13	0.93	1.00	0.83
1987	0.86	0.93	1.00	1.18	1.21	1.00	1.07	0.88
1988	0.91	0.92	1.00	1.14	1.17	0.96	1.00	0.89
1989	0.85	0.92	1.00	1.11	1.15	0.98	1.03	0.92
1990	0.85	0.93	1.00	1.18	1.18	1.01	1.02	0.90
1991	0.84	0.95	1.00	1.15	1.26	1.05	1.08	0.95
1992	0.78	0.91	1.00	1.15	1.14	1.04	1.09	0.96
1993	0.81	0.90	1.00	1.29	1.26	1.11	1.10	1.08
1994	0.78	0.93	1.00	1.26	1.30	1.13	1.19	1.10
				B. Food Consumption				
1972–73	1.13	1.02	1.00	1.16	1.28	1.22		
1980–81	1.00	1.00	1.00	1.16	1.26	1.17		
1982–83	0.88	0.94	1.00	1.13	1.20	1.16		
1984	0.92	0.88	1.00	1.11	1.10	1.00	1.07	0.86
1985	0.92	0.96	1.00	1.15	1.18	1.04	1.07	0.99
1986	0.90	0.90	1.00	1.21	1.10	0.98	1.03	0.91
1987	0.90	0.93	1.00	1.17	1.24	1.10	1.15	1.03
1988	0.97	0.93	1.00	1.18	1.28	1.02	1.07	0.92
1989	0.88	0.91	1.00	1.13	1.21	1.02	1.06	0.99
1990	0.94	0.90	1.00	1.16	1.18	1.06	1.07	0.92
1991	0.86	0.93	1.00	1.06	1.12	1.11	1.11	1.04
1992	0.85	0.92	1.00	1.15	1.11	1.15	1.24	1.00
1993	0.85	0.92	1.00	1.21	1.24	1.18	1.18	1.12
1994	0.83	0.89	1.00	1.20	1.23	1.14	1.17	1.14
				C. Clothes Consumption				
1972–73	1.13	1.02	1.00	1.17	1.16	0.75		
1980–81	1.05	0.99	1.00	1.05	1.03	0.69		
1982–83	1.06	0.97	1.00	1.05	1.01	0.74		
1984	0.94	0.88	1.00	0.94	0.96	0.71	0.84	0.48
1985	0.89	0.87	1.00	1.07	1.13	0.79	0.93	0.54
1986	0.83	0.91	1.00	1.16	1.00	0.63	0.71	0.51
1987	0.84	0.87	1.00	1.14	1.03	0.81	0.92	0.62
1988	0.95	0.88	1.00	1.19	1.01	0.69	0.80	0.49
1989	0.97	0.88	1.00	1.03	1.06	0.77	0.92	0.55
1990	0.82	0.80	1.00	1.07	0.97	0.64	0.73	0.44
1991	0.94	0.86	1.00	1.05	0.99	0.83	0.94	0.60
1992	0.97	0.95	1.00	1.16	0.98	0.75	0.82	0.64
1993	1.00	1.00	1.00	1.25	1.17	0.88	0.98	0.68
1994	0.86	0.97	1.00	1.26	1.12	0.80	0.91	0.66

Source: Consumer Expenditure Survey (1972–73, 1980–94).

Table 4.4 **Relative Per-Member Consumption in U.K. Households**

	−29	30–49	50–64	65–	65–74	75–
			A. Total Consumption			
1971	1.03	1.00	1.38	1.05		
1972	1.06	1.00	1.36	1.04		
1973	1.09	1.00	1.35	1.00		
1974	1.07	1.00	1.35	1.03		
1975	1.05	1.00	1.33	1.02		
1976	1.04	1.00	1.35	1.04		
1977	1.06	1.00	1.25	1.02		
1978	1.08	1.00	1.28	1.02		
1979	1.08	1.00	1.28	0.95		
1980	1.04	1.00	1.34	1.01		
1981	1.03	1.00	1.30	1.01		
1982	1.00	1.00	1.30	0.96		
1983	0.97	1.00	1.30	1.04		
1984	1.01	1.00	1.34		1.06	0.94
1985	0.97	1.00	1.29		1.05	0.90
1986	0.99	1.00	1.22		1.05	0.89
1987	0.97	1.00	1.23		1.05	0.88
1988	1.06	1.00	1.26		1.05	0.90
1989	0.97	1.00	1.27		1.08	0.86
1990	1.06	1.00	1.26		1.06	0.86
1991	0.99	1.00	1.26		1.06	0.90
			B. Food Consumption			
1971	0.93	1.00	1.31	1.10		
1972	0.98	1.00	1.30	1.12		
1973	0.97	1.00	1.29	1.11		
1974	0.98	1.00	1.30	1.12		
1975	0.97	1.00	1.27	1.11		
1976	1.00	1.00	1.31	1.15		
1977	0.98	1.00	1.26	1.15		
1978	1.00	1.00	1.28	1.12		
1979	0.98	1.00	1.26	1.11		
1980	0.98	1.00	1.26	1.08		
1981	0.98	1.00	1.25	1.11		
1982	.96	1.00	1.26	1.13		
1983	0.92	1.00	1.23	1.11		
1984	0.94	1.00	1.25		1.14	1.06
1985	0.95	1.00	1.24		1.13	1.06
1986	0.94	1.00	1.22		1.14	1.00
1987	0.96	1.00	1.21		1.11	1.00
1988	0.99	1.00	1.20		1.12	0.97
1989	0.92	1.00	1.21		1.08	0.97
1990	0.94	1.00	1.21		1.09	0.96
1991	0.94	1.00	1.23		1.08	0.97
			C. Clothes Consumption			
1971	0.93	1.00	1.31	0.82		
1972	0.99	1.00	1.31	0.80		

(*continued*)

Table 4.4 (continued)

	−29	30–49	50–64	65–	65–74	75–
1973	0.97	1.00	1.19	0.71		
1974	1.02	1.00	1.27	0.81		
1975	0.98	1.00	1.28	0.80		
1976	0.93	1.00	1.27	0.70		
1977	0.96	1.00	1.14	0.72		
1978	0.98	1.00	1.25	0.73		
1979	1.00	1.00	1.21	0.68		
1980	0.98	1.00	1.26	0.71		
1981	0.99	1.00	1.25	0.72		
1982	0.91	1.00	1.11	0.73		
1983	0.96	1.00	1.17	0.70		
1984	1.10	1.00	1.12		0.76	0.60
1985	0.96	1.00	1.08		0.72	0.58
1986	1.05	1.00	1.14		0.79	0.57
1987	0.97	1.00	1.05		0.74	0.44
1988	1.02	1.00	1.07		0.72	0.49
1989	0.95	1.00	1.11		0.72	0.54
1990	1.01	1.00	1.02		0.75	0.44
1991	0.97	1.00	1.09		0.76	0.49

Source: Family Expenditure Survey (1971–91).

resources are transferred from the young or middle-aged to the elderly in countries such as Japan and the United States, where large-scale public pension schemes have been established. The next section provides an analytical framework for interpreting the described evolution of the cross-age consumption distribution and for quantifying the differences in lifetime income among cohorts.

4.2.3 The Cross-Age Distribution of Labor Income

The simplest interpretation of the above evolution of consumption distribution is that relative consumption simply reflects relative labor income among age groups when consumers are myopic or liquidity-constrained. Any parallel movement between the consumption and income distributions is a necessary condition for this view. Before concluding this section, I explore the validity of this assertion by examining the cross-age distribution of labor income.

Tables 4.5–4.7 illustrate the movement of relative labor income per household member in Japan, the United States, and the United Kingdom. For Japan, I can report only on workers' households, as in table 4.5, because there is no income item that is common to all households. The pattern of labor-income distribution broadly follows the consumption distribution; the relative ratio of those in their fifties has increased in terms of both labor income and consumption.

Table 4.5 **Relative Per-Member Labor Income in Workers' Households in Japan**

	−24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–; 65–69	70–; 70–74	75–
1959	0.80	1.07	0.99	0.99	1.00	1.08	1.25	1.15	1.15	1.09		
1964	0.87	1.03	0.96	0.98	1.00	1.11	1.26	1.22	1.04	1.22		
1974	1.04	1.00	0.92	0.91	1.00	1.18	1.32	1.27	1.10	0.99		
1979	1.00	1.00	0.90	0.92	1.00	1.19	1.45	1.46	1.19	1.10		
1984	1.00	1.00	0.89	0.91	1.00	1.17	1.43	1.48	1.16	1.06	1.02	1.08
1989	0.94	0.98	0.92	0.91	1.00	1.19	1.47	1.60	1.20	0.98	1.23	0.95
1994	0.92	1.07	0.98	0.94	1.00	1.20	1.54	1.69	1.27	1.02	1.01	

Source: National Survey on Family Income and Expenditure (1959–94).

Table 4.6 Relative Per-Member Labor Income in U.S. Households

	−24	25–34	35–44	45–54	55–64	65–	65–74	75–
1972–73	1.18	1.14	1.00	1.27	1.36	0.32		
1980–81	0.92	1.13	1.00	1.17	1.14	0.23		
1982–83	0.74	1.06	1.00	1.10	0.95	0.20		
1984	0.75	0.97	1.00	1.01	0.86	0.20	0.27	0.08
1985	0.68	1.01	1.00	1.10	0.95	0.22	0.29	0.10
1986	0.69	0.96	1.00	1.16	0.98	0.20	0.27	0.10
1987	0.66	0.99	1.00	1.18	1.05	0.20	0.26	0.09
1988	0.72	0.06	1.00	1.21	1.01	0.22	0.30	0.07
1989	0.68	0.95	1.00	1.08	0.98	0.19	0.28	0.05
1990	0.63	0.96	1.00	1.18	0.98	0.19	0.27	0.07
1991	0.61	0.99	1.00	1.21	1.09	0.21	0.29	0.06
1992	0.59	0.91	1.00	1.17	0.94	0.21	0.29	0.09
1993	0.62	0.88	1.00	1.25	0.97	0.21	0.28	0.08
1994	0.54	0.87	1.00	1.19	1.08	0.19	0.25	0.10

Source: Consumer Expenditure Survey (1972–73, 1980–94).

However, the income and consumption distributions have evolved differently in the United States (table 4.6) and the United Kingdom (table 4.7). In the United States, the ratio for those in their twenties has declined much faster for labor income than for consumption; the opposite is true for those in their fifties, with a faster increase in their consumption than in their labor income. In the United Kingdom, the ratio for those in their twenties has been stable for consumption but has shown a substantial increase for labor income.

Given these observations, one might say that households are subject to liquidity constraints or behave myopically in Japan. However, the parallel movement is a necessary condition, and therefore is not sufficient evidence for any liquidity constraints. When both labor income and consumption include common permanent shocks or are influenced by common fixed effects, both move together even in the absence of liquidity constraints. One cannot reach any definite conclusion without applying theoretical models to these data sets. In the next section, after presenting theoretical framework, I will reexamine this issue.

4.3 Analytical Framework

4.3.1 Simple Model with Cohort Structure

Extending my earlier work (Saito 1997), this section presents an analytical framework for assessing the evolution of the consumption distribution among different age groups. Let us assume that there are both spot and future markets in which the future delivery of goods on a certain date is

Table 4.7 **Relative Per-Member Labor Income in U.K. Households**

	−29	30–49	50–64	65–	65–74	75–
1971	1.04	1.00	1.35	0.34		
1972	1.11	1.00	1.30	0.32		
1973	1.08	1.00	1.37	0.29		
1974	1.12	1.00	1.38	0.32		
1975	1.12	1.00	1.29	0.28		
1976	1.11	1.00	1.33	0.24		
1977	1.14	1.00	1.32	0.25		
1978	1.15	1.00	1.28	0.23		
1979	1.09	1.00	1.29	0.22		
1980	1.38	1.00	1.43	0.56		
1981	1.49	1.00	1.40	0.48		
1982	1.45	1.00	1.40	0.45		
1983	1.34	1.00	1.32	0.44		
1984	1.42	1.00	1.34		0.44	0.32
1985	1.35	1.00	1.25		0.38	0.37
1986	1.46	1.00	1.27		0.37	0.36
1987	1.42	1.00	1.22		0.39	0.23
1988	1.46	1.00	1.20		0.39	0.29
1989	1.37	1.00	1.25		0.35	0.25
1990	1.41	1.00	1.19		0.40	0.27
1991	1.45	1.00	1.13		0.36	0.23

Source: Family Expenditure Survey (1971–91).

contracted. A claim for a unit of time t goods is traded at the price $p(t)$. The price of time 0 goods is the numeraire. It is assumed that a set of prices is determined by a certain resource allocation mechanism.[3]

Given the above market structure, a cohort born at time i solves the following maximization problem:

$$\max \sum_{j=1}^{J} \mu_j \frac{c_i(i+j)^{1-1/\varepsilon}}{1-\frac{1}{\varepsilon}} \tag{1}$$

subject to

$$\sum_{j=1}^{J} p(i+j)[e_i(i+j) + d_i(i+j) - c_i(i+j)] = 0,$$

3. When all agents participate in markets at the specified time 0, competitive markets where all agents take prices as given can determine a set of prices of contingent claims. Since new cohorts enter markets later in this economy, competitive markets may not be an appropriate device for determining prices of contingent claims. In order for prices to be determined at time 0, this economy may require some institutions, such as banks and insurance companies, to form rational expectations and to exploit arbitrage opportunities.

where ε is the elasticity of intertemporal substitution, and μ_j is a weight on period utility of age j ($j = 1,2, \ldots J$).[4] These parameters are common among cohorts. $c_i(t)$, $e_i(t)$, and $d_i(t)$ are the cohort i's consumption, exogenous income, and transfer from different cohorts at time t. λ_i denotes the Lagrange multiplier on the cohort i's lifetime budget constraint. The first-order condition with respect to the consumption goods at age j by cohort i is

$$\mu_j c_i(i + j)^{-1/\varepsilon} = \lambda_i p(i + j). \tag{2}$$

Taking the logarithm from both sides, we obtain

$$\ln c_i(i + j) = \varepsilon[\ln \mu_j - \ln \lambda_i - \ln p(i + j)]. \tag{3}$$

Equation (3) implies that consumption at age j by cohort i can be divided into three factors: age-specific, cohort-specific, and time-specific. Each factor on the right-hand side of equation (3) is intuitively understandable. First, the higher the age-specific weight μ_j, the more consumption increases. Second, the lifetime income of cohort i is a decreasing function in the Lagrange multiplier λ_i (the marginal utility with respect to lifetime income), and the consumption of cohort i consequently decreases in λ_i due to lower lifetime income. Third, the price of a unit of time $i + j$ goods $p(i + j)$ represents the degree of resource scarcity. As fewer goods are provided at time $i + k$, $p(i + j)$ increases, and consumption decreases. In other words, the third effect represents an aggregate supply factor or a macroeconomic effect.

4.3.2 Empirical Implication

By using equation (3), I give a theoretical interpretation to the cross-sectional consumption distribution among the age groups, which was examined in the previous section. Let us now examine the difference in log-consumption at time $i + j$ between the two cohorts, such that $i + j = i' + j'$.

$$\ln \frac{c_i(i + j)}{c_{i'}(i' + j')} = \varepsilon \left(\ln \frac{\mu_j}{\mu_{j'}} - \ln \frac{\lambda_i}{\lambda_{j'}} \right) \tag{4}$$

Equation (4) implies that relative consumption is the result of two effects: the difference in the age weight, and the difference in the Lagrange multiplier. Hereafter, the former is termed the *age effect* and the latter the *cohort effect.* Equation (4) can also be written as

4. In this model, we treat each cohort as a representative agent, and abstract the issue of the within-cohort consumption distribution. Deaton and Paxson (1994) address this issue using U.S. and U.K. microdata while Ohtake and Saito (1998) replicate the issue using Japanese microdata.

$$(5) \qquad \ln \frac{c_i(i + j)}{c_{i'}(i' + j')} = \sum_{m=1}^{J} \alpha_m \text{age dummy}_m + \sum_{n=1}^{I} \beta_n \text{cohort dummy}_n,$$

where age dummy$_j$ is $+1$, age dummy$_{j'}$ is -1, and the other age dummies are zero. In contrast, cohort dummy$_i$ is -1, cohort dummy$_{i'}$ is $+1$, and the other cohort dummies are zero. α_j corresponds to $\varepsilon \ln \mu_j$ while β_i corresponds to $\varepsilon \ln \lambda_i$. One major advantage of equation (5) as an empirical specification is that the right-hand side includes only fixed effects—that is, the year of birth and age, both of which are outside the control of each cohort.

4.3.3 The Altruistic Motive versus the Life Cycle Hypothesis

Equation (5) provides a hypothesis that tests the altruistic motive against the life-cycle hypothesis. If cohorts are linked through the altruistic motive, á la Barro (1974), and the lifetime utility of all cohorts is weighted equally within a dynasty, then all cohorts are subject to the same budget constraint. Thus, the Lagrange multiplier has an identical value across all cohorts. That is,

$$\lambda_i = \lambda_{i'} \quad \forall \; i, \quad i'$$

must hold when cohorts are linked altruistically.

The cross-cohort difference in the Lagrange multiplier λ_i, on the other hand, implies that lifetime income differs among cohorts. At the optimal level of consumption, we obtain

$$\lambda_i^{\varepsilon} = \frac{1}{w_i} \sum_{j=1}^{J} [\mu_j^{\varepsilon} p(i + j)^{1-\varepsilon}],$$

where w_i is the value of the cohort i's lifetime income evaluated at the real price of goods, or where

$$w_i = \sum_{j=1}^{J} p(i + j)[e_i(i + j) + d_i(i + j)].$$

When the elasticity of intertemporal substitution is close to one, the effect of market prices on λ_i is represented solely by w_i. The difference in $\varepsilon \ln \lambda_i$ between two cohorts can be, accordingly, approximated by the difference in the logarithmic lifetime income. In other words,

$$(6) \qquad \varepsilon \ln \frac{\lambda_i}{\lambda_{i'}} \approx -\ln \frac{w_i}{w_{i'}},$$

when ε is close to one. Thus, the relative differences in lifetime incomes are inferable from the estimated coefficient on the cohort effect of equation (5) under the assumption of a unit elasticity of intertemporal substitution.[5]

4.3.4 The Sustainability of the Living Standard

This subsection emphasizes that the value of cohort *i*'s lifetime income can be inferred from λ_i and can be evaluated in terms of the real price of goods. In other words, an evaluation of lifetime income of any cohort group takes into consideration resource scarcity and then measures this lifetime income level relative to the resource availability. In most cases, this feature embodied in λ_i itself is economically relevant when comparing welfare levels among cohorts. Without considering resource abundance (scarcity), it is obvious that younger cohorts enjoy more consumption goods in a growing economy.

Comparing the absolute level of consumption, or the living standard, among cohorts may also be important in the current context. In particular, whether the living standard of the youth and their future generations will be sustained is becoming increasingly important. To compare, the Lagrange multiplier λ_i, or the value of lifetime income w_i, must be converted into the absolute level of consumption, or the living-standard term.

It should be observed that higher λ_i or lower w_i does not necessarily imply that the living standard of cohort *i* deteriorates, because the real price of goods declines as a result of economic growth. Thus, consumption levels may be even greater when λ_i is higher or w_i is lower. Suppose that the real price of goods is determined according to the marginal period utility of a representative agent, or

$$p(t) = C(t)^{-1/\varepsilon}, \tag{7}$$

where $C(t)$ is an aggregate level of consumption at time t.[6] Substituting equation (7) to equation (3), we obtain the following result:

$$\ln c_i(t) = \varepsilon \ln \mu_j - \varepsilon \ln \lambda_i + \ln C(t).$$

5. My approach is related to Mace (1991), Cochrane (1991), Altug and Miller (1990), and Hayashi, Altonji, and Kotlikoff (1996) in the sense that all of them have empirically tested theoretical restrictions imposed on the marginal utility in a complete market setup. These empirical models differ, however, from my empirical specification because they cancel the Lagrange multiplier by taking a first difference of individual consumption instead of estimating the multiplier. My main goal in this paper is to estimate the Lagrange multiplier cohort by cohort.

6. More precisely, when the same technique used in the aggregation theorem (Rubinstein 1974) is applied, the real price at time t is determined by $p(t) = C(t)^{-1/\varepsilon} \{\Sigma_{j=1}^{J}[s_j(t)\lambda_{i=j}^{-\varepsilon}\mu_j^{\varepsilon}]\}^{1/\varepsilon}$, where $s_j(t)$ is the population share of cohort j at time t. On the right-hand side, the first term $C(t)^{-1/\varepsilon}$ represents the aggregate supply effect while the terms in the brackets correspond to the aggregate demand effect. I abstract the latter in characterizing the real price $p(t)$ by equation (7).

By abstracting the age effect, and denoting the cohort i's average consumption (living standard) by c_i and the average aggregate consumption level realized when cohort i is alive by C_i, we can derive any difference in the living standard between the two cohorts

$$(8) \qquad \ln c_i - \ln c_{i'} = -\varepsilon(\ln \lambda_i - \ln \lambda_{i'}) + (\ln C_i - \ln C_{i'}).$$

According to equation (8), $\lambda_i > \lambda_{i'}$ or $w_i < w_{i'}$ does not necessarily imply $c_i < c_{i'}$ when an economy grows fast or $C_i >> C_{i'}$.

4.3.5 Examples

This subsection presents several examples to explain the implication of equation (4) intuitively. Throughout this subsection, I assume that each cohort lives for three periods—young, middle-aged, and old—and that one household enters the economy at each period.

As discussed above, the difference in logarithmic consumption between any two cohorts at a given point in time is free of any macroeconomic effect. To illustrate this independence, I must compare figure 4.1 and figure 4.2. The former shows that in a time of economic boom the level of consumption for all generations increases simultaneously at time 3. The latter shows that a recession decreases the level of consumption. The relative logarithmic consumption among three generations at time 3 does not differ between the two cases, however.

I then examine the case where the altruistic motive is compared with the life cycle hypothesis. For the sake of simplicity, it is assumed that neither the age effect nor the business cycle effect is present. When lifetime income is distributed equally over the generations as a result of the altruistic motive, the consumption profile is identical among all generations (see fig. 4.3). In this case, the ratio of log-consumption for each age group

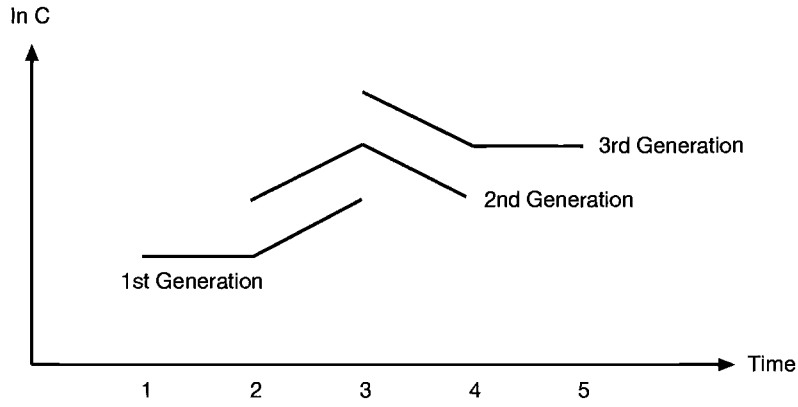

Fig. 4.1 Effects of business cycles in the case of a boom

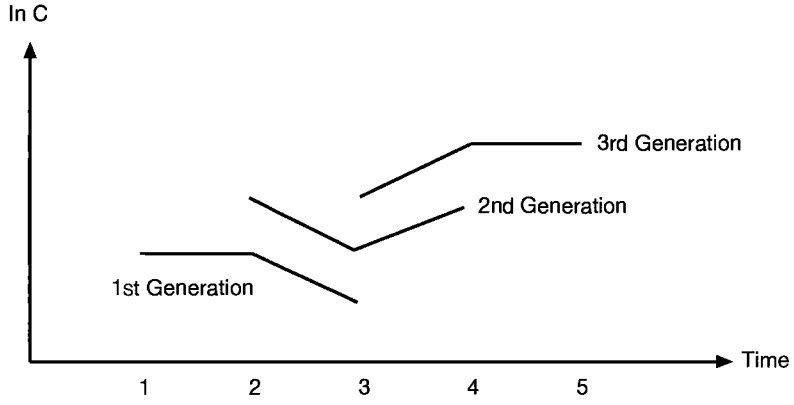

Fig. 4.2 Effects of business cycles in the case of a recession

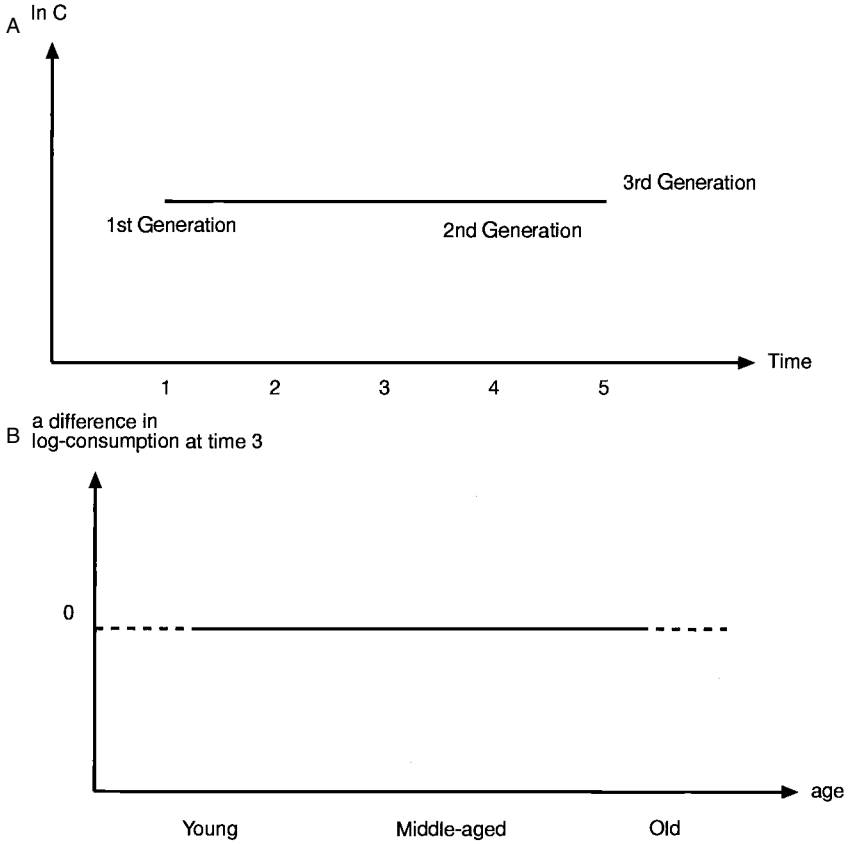

Fig. 4.3 The case of perfect altruism; (*A*), intergenerational consumption pattern, and (*B*), relative logarithmic consumption profile

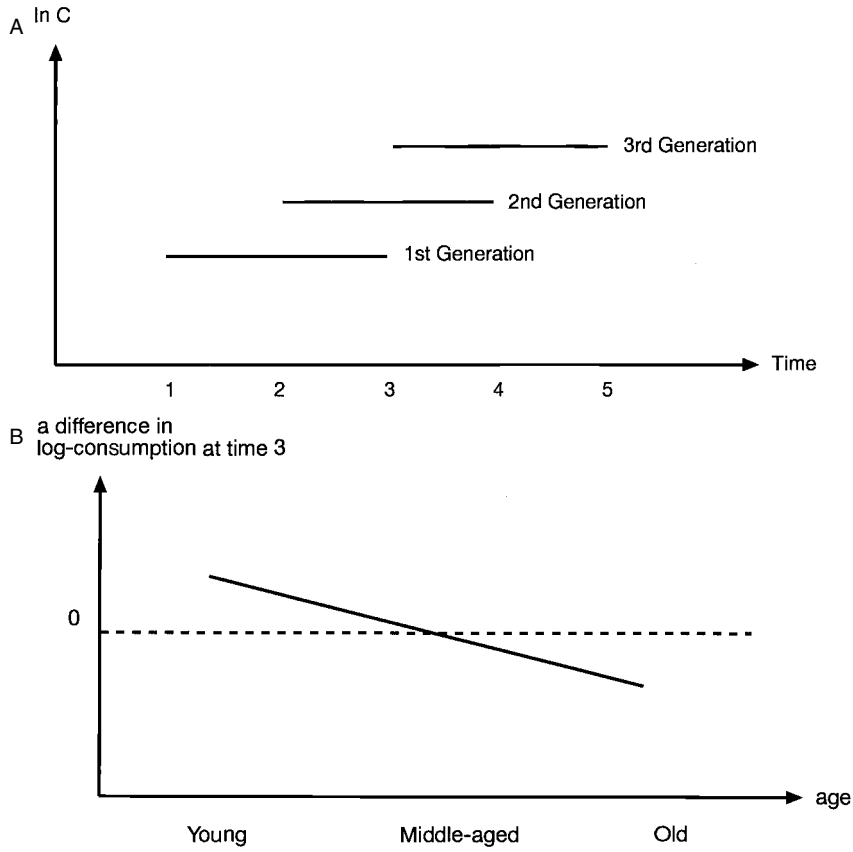

Fig. 4.4 The case of increasing welfare; (*A*), intergenerational consumption pattern, and (*B*), relative logarithmic consumption profile

relative to that of the middle-aged group is completely flat. On the other hand, when lifetime income increases for youth, the ratio is downward sloping (see fig. 4.4). Similarly, when lifetime income decreases for youth, the same ratio shows an upward trend (see fig. 4.5).

This suggests that cohort effects are identifiable from the evolution of the cross-age distribution of log-consumption. By using the consumption data—for example, as represented by figure 4.6—the above-defined ratio is downward sloping at the beginning of the sample period; it is almost flat in the middle; and finally, it tends to slope upward as time runs out. Thus, the difference in lifetime income among generations is inferable from the evolution of the cross-age consumption distribution.

Contrarily, if we find time-invariant patterns in the cross-age consumption distribution, we can infer that the cohort effect is absent and that only

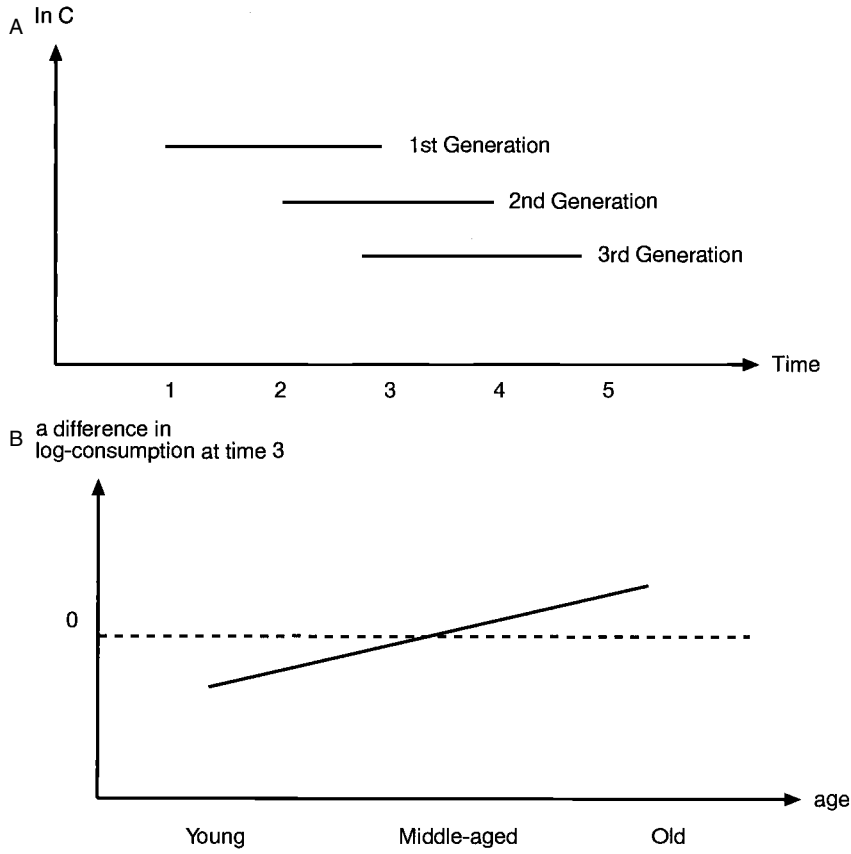

Fig. 4.5 The case of declining welfare; (*A*), intergenerational consumption pattern, and (*B*), relative logarithmic consumption profile

the age effect is significant. In summary, the cohort effect can be identified by the time-varying nature of the cross-age consumption distribution, while the age effect can be identified by the time-invariant nature.

4.3.5 Effects of Liquidity Constraints

So far I have maintained that each cohort can trade at both spot and future markets without any constraints. This subsection explores the possibility that cohorts may be subject to liquidity constraints. That is, agents may fail to smooth consumption because of liquidity constraints.

When liquidity constraints are binding on some cohorts, unlike those in equation (5), then the relative log-consumption between two cohorts depends not only on fixed effects (both the age and cohort effects) but also on current liquidity positions. One way to examine the extent of liquidity

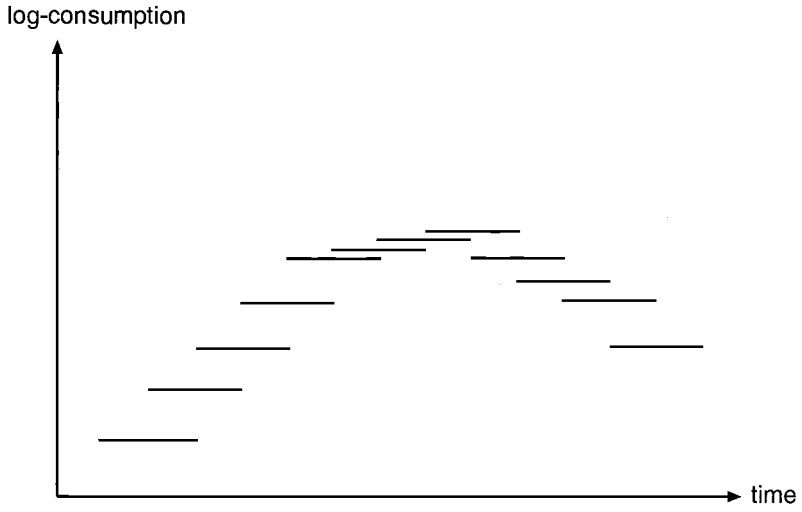

Fig. 4.6 The evolution of cross-age consumption profiles

constraints is to add the relative logarithmic labor income (endowment), or the equation

$$\ln \frac{e_i(i + j)}{e_{i'}(i' + j')}$$

to the right-hand side of equation (5). The explanatory power of this additional term may suggest that liquidity restraints are binding on some cohorts.

4.4 Estimation Results

4.4.1 The Comparison of Cohort Effects

In this section, I apply the empirical specification (equation [5]) to the cross-age consumption distributions of Japan, the United States, and the United Kingdom. These were all examined in depth in section 4.2. The goal of this section is to quantify the cross-cohort differences in lifetime income for these countries. In particular, I am interested in whether the lifetime incomes of the current youth have declined in comparison with the lifetime incomes received by the current elderly generation.

As in section 4.2, age bands were chosen as points of reference for each age group in formulating the relative log-consumption ratio. To avoid any linear dependence of age dummies, I excluded the age dummy group that included individuals aged forty. The cohort dummy is formulated ac-

cording to the following year bands: those born before 1907, those born during the years 1907–11, 1912–16, 1917–21, 1922–26, 1927–31, 1932–36, 1937–41, 1942–46, 1947–51, 1952–56, 1957–61, 1962–66, and finally, those born after 1966. Similarly, I exclude cohorts born between 1942 and 1946 in order to remove any linear dependence on cohort dummies.

Accordingly, the estimated α_j of equation (5) implies the ratio of the age-specific weight on period utility relative to that of the age band including the age forty, while the estimated β_i is the ratio of the logarithmic Lagrange multiplier relative to that of the cohort 1942–46. As equation (6) implies, the latter coefficient approximates an inverse of the ratio of the lifetime income of each cohort to that of the cohort 1942–46.

Tables 4.8–4.10 report the estimation results for Japan, the United States, and the United Kingdom, respectively. In all these countries, the estimated cohort effect (the estimated relative logarithmic Lagrange multiplier, β_i's) differs substantially among cohorts; the equality of all β_i's is rejected strongly for total consumption as well as for food/clothes consumption. These findings suggest that the altruistic motive is either absent or weak in these countries. This is consistent with the existing empirical results based on the microdata sets; for example, Hayashi (1995) for Japan and Altonji, Hayashi, and Kotlikoff (1992) for the United States.

A closer look at the estimated cohort effect gives us more detailed information concerning the cross-cohort difference in the Lagrange multiplier or lifetime income for each country. In Japan (see table 4.8), the estimation result from total consumption indicates that lifetime income peaked at the cohort 1932–36 while it decreased for younger cohorts. Figure 4.7, which plots the estimated β's with the 95 percent confidence interval, illustrates this cross-cohort pattern. This same pattern is observed in results from food consumption. However, there is no statistical decrease for younger cohorts in lifetime income in the results from clothes consumption.

In the United States, the results from total consumption indicate that lifetime income peaked at the cohort 1947–51 and deteriorated substantially for younger cohorts (see table 4.9 and fig. 4.8). A less serious decline in the younger cohorts' lifetime income is shown in the results from food consumption, while there is no evidence for such a deterioration from clothes consumption. United Kingdom estimates based on total consumption as well as on food and clothes consumption show, by contrast, that lifetime incomes are higher for younger cohorts (see table 4.10 and fig. 4.9).

4.4.2 The Sustainability of the Living Standard

Using the estimation results for total consumption, figure 4.10 contrasts this cross-cohort pattern for Japan, the United States, and the United Kingdom. In both Japan and the United States, lifetime income has deteriorated for younger cohorts while it has improved among younger cohorts in the United Kingdom. Deterioration in the lifetime income of young

Table 4.8 **Estimation Results of Age and Cohort Effects in Workers' Households in Japan**

	Total Consumption		Food		Clothes	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Age dummy						
−24	0.166	(0.035)	0.045	(0.033)	0.161	(0.081)
25–29	0.109	(0.026)	−0.017	(0.025)	0.059	(0.060)
30–34	−0.019	(0.020)	−0.088	(0.019)	−0.066	(0.046)
35–39	−0.062	(0.016)	−0.068	(0.015)	−0.087	(0.037)
45–49	0.196	(0.017)	0.065	(0.016)	0.200	(0.038)
50–54	0.361	(0.023)	0.111	(0.022)	0.385	(0.053)
55–60	0.403	(0.032)	0.152	(0.030)	0.446	(0.072)
60–64	0.395	(0.041)	0.207	(0.039)	0.406	(0.093)
65–	0.418	(0.054)	0.277	(0.051)	0.428	(0.123)
Cohort dummy						
1902–06	0.302	(0.078)	0.204	(0.074)	0.451	(0.178)
1907–11	0.136	(0.069)	0.153	(0.065)	0.199	(0.156)
1912–16	0.170	(0.066)	0.158	(0.062)	0.183	(0.149)
1917–21	0.078	(0.049)	0.069	(0.046)	0.025	(0.112)
1922–26	0.039	(0.043)	0.066	(0.041)	0.005	(0.098)
1927–31	−0.012	(0.033)	0.020	(0.031)	−0.062	(0.076)
1932–36	−0.037	(0.022)	0.020	(0.020)	−0.080	(0.049)
1937–41	−0.014	(0.013)	0.009	(0.012)	−0.012	(0.029)
1947–51	0.015	(0.013)	0.026	(0.012)	−0.016	(0.029)
1952–56	0.043	(0.020)	0.078	(0.019)	−0.018	(0.046)
1957–61	0.038	(0.034)	0.125	(0.032)	−0.040	(0.077)
1962–66	0.051	(0.044)	0.201	(0.041)	0.006	(0.100)
1967–71	0.014	(0.031)	0.281	(0.029)	0.071	(0.070)
Adjusted R^2	0.985		0.973		0.943	

Source: National Survey on Family Income and Expenditure (1959–94).

cohorts has been much more rapid in the United States than in Japan. The value of lifetime income has declined by 26 percent in a twenty-year period, or between the 1947–51 cohort and the 1967–71 cohort in the United States. By contrast, it decreased 9 percent in a thirty-year period in Japan, or between the 1932–36 cohort and the 1962–66 cohort.

As discussed in the previous section (section 4.3), when an economy is growing and the real price of goods is decreasing, a corresponding decline in the value of lifetime income does not necessarily imply a decline in the living standard. Therefore, an important policy question is whether high economic growth can compensate for a decline in the value of lifetime income for the younger cohorts, thus allowing their living standard to be sustained.

Equation (8) allows us to calculate the minimum growth rate required to sustain the living standard of the current young generation. For instance,

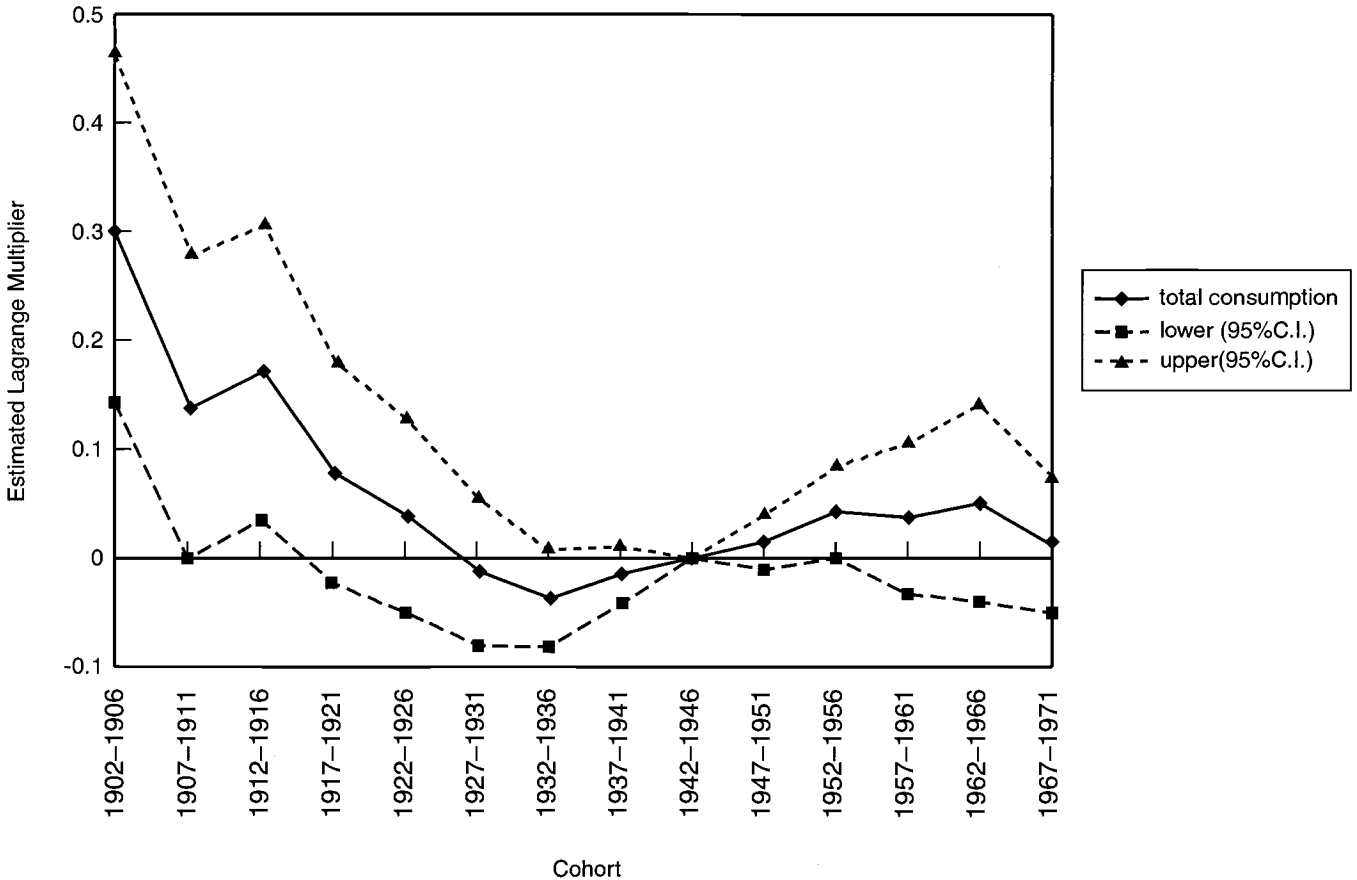

Fig. 4.7 Estimated Lagrange multipliers in workers' households in Japan (cohort: 1942 − 1946 = 0)

Table 4.9 Estimation Results of Age and Cohort Effects in U.S. Households

	Total Consumption		Food		Clothes	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Age dummy						
−24	−0.017	(0.045)	−0.103	(0.044)	−0.270	(0.095)
25–34	−0.003	(0.033)	−0.095	(0.032)	−0.223	(0.069)
45–54	0.274	(0.031)	0.238	(0.030)	0.328	(0.065)
55–64	0.412	(0.055)	0.356	(0.054)	0.506	(0.116)
65–	0.307	(0.073)	0.323	(0.071)	0.337	(0.153)
Cohort dummy						
1907–11	0.424	(0.081)	0.376	(0.079)	0.986	(0.171)
1912–16	0.329	(0.071)	0.290	(0.069)	0.730	(0.148)
1917–21	0.271	(0.064)	0.234	(0.063)	0.539	(0.135)
1922–26	0.251	(0.057)	0.208	(0.056)	0.453	(0.120)
1927–31	0.207	(0.049)	0.152	(0.048)	0.395	(0.104)
1932–36	0.199	(0.029)	0.146	(0.028)	0.294	(0.061)
1937–41	0.087	(0.024)	0.086	(0.024)	0.108	(0.051)
1947–51	−0.039	(0.018)	−0.027	(0.017)	−0.119	(0.037)
1952–56	0.003	(0.026)	−0.016	(0.025)	−0.124	(0.054)
1957–61	0.062	(0.044)	−0.024	(0.043)	−0.192	(0.092)
1962–66	0.092	(0.055)	−0.027	(0.054)	−0.298	(0.116)
1967–71	0.219	(0.071)	0.051	(0.070)	−0.334	(0.150)
Adjusted R^2	0.844		0.807		0.763	

Source: Consumer Expenditure Survey (1972–73, 1980–94).

consider the U.S. cohort 1947–51 (the current middle-aged) compared to the cohort 1967–71 (the current youth). As mentioned earlier, the value of lifetime income has declined by 26 percent from the former cohort to the latter. Thus, the U.S. economy would have to grow at no less than 1.3 percent per year for the next twenty years in order for the living standard of the current young generation to catch up with that of the current middle-aged one. This required growth rate is less demanding from the viewpoint of past growth experience of the United States (where per capita consumption grew at 1.9 percent annually from 1974 to 1994). If the U.S. economy were to grow as steadily as it did in the past, then the living standard of the current young generation would still improve. Without sound economic growth, however, their living standard may be unsustainable under the existing U.S. welfare program.

4.4.3 Effects of Liquidity Positions

In this subsection, I examine the effects of the liquidity position on the cross-age distribution of consumption or the presence of liquidity constraints. To achieve this, I regress the estimated residuals of equation (5) on the relative logarithmic labor income per household member. In addi-

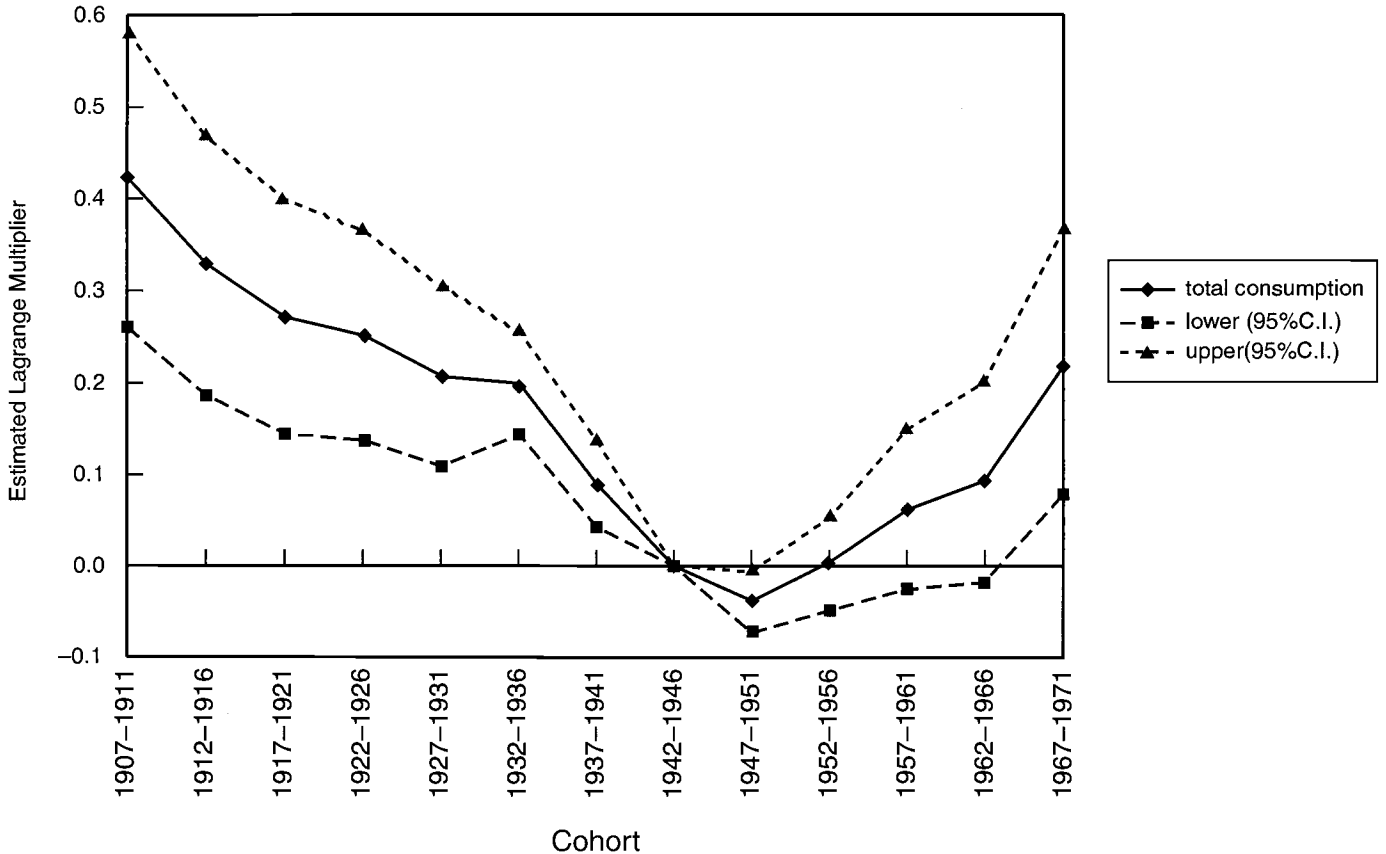

Fig. 4.8 Estimated Lagrange multipliers in the United States (cohort: 1942 − 1946 = 0)

Table 4.10 **Estimation Results of Age and Cohort Effects in U.K. Households**

	Total Consumption		Food		Clothes	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Age dummy						
−29	−0.044	(0.019)	−0.104	(0.013)	−0.291	(0.040)
50–64	0.402	(0.028)	0.324	(0.019)	0.511	(0.057)
65–	0.246	(0.045)	0.249	(0.030)	0.219	(0.093)
Cohort dummy						
1907–11	0.333	(0.055)	0.214	(0.037)	0.755	(0.114)
1912–16	0.255	(0.044)	0.166	(0.030)	0.645	(0.091)
1917–21	0.176	(0.040)	0.114	(0.027)	0.437	(0.082)
1922–26	0.152	(0.034)	0.114	(0.023)	0.389	(0.069)
1927–31	0.137	(0.024)	0.087	(0.016)	0.352	(0.050)
1932–36	0.106	(0.018)	0.075	(0.012)	0.258	(0.036)
1937–41	0.023	(0.015)	0.023	(0.010)	0.095	(0.030)
1947–51	−0.065	(0.014)	−0.068	(0.009)	−0.181	(0.029)
1952–56	−0.030	(0.024)	−0.045	(0.016)	−0.284	(0.049)
1957–61	−0.117	(0.030)	−0.120	(0.020)	−0.455	(0.062)
Adjusted R^2	0.914		0.948		0.913	

Source: Family Expenditure Survey (1971–91).

tion, to learn which age groups are more subject to liquidity constraints, the estimated residuals are regressed on a set of

$$\text{age dummy}_j \times \ln \frac{e_i(i + j)}{e_{i'}(i' + j')},$$

where j denotes age groups. In both cases, the reference age group is assumed to be the age band that includes a head of household aged forty.

Table 4.11 reports the estimation results for all three countries. The overall result suggests that liquidity positions do not help to explain the evolution of the cross-age consumption distribution. The only exceptions are the liquidity positions of the Japanese in their twenties (food/clothes) and Americans in their sixties (both total and food/clothes consumption). As far as these estimation results are concerned, there is no conclusive evidence in support of liquidity constraints, and the evolution of the cross-age consumption distribution has not been influenced directly by the cross-age distribution of liquidity positions in either Japan, the United States, or the United Kingdom.[7]

7. Using a different data set of the Japanese expenditure survey (the Family Income and Expenditure Survey), Saito (1997) finds that the consumption distribution depends on the labor income distribution not only in young groups, but also in old groups.

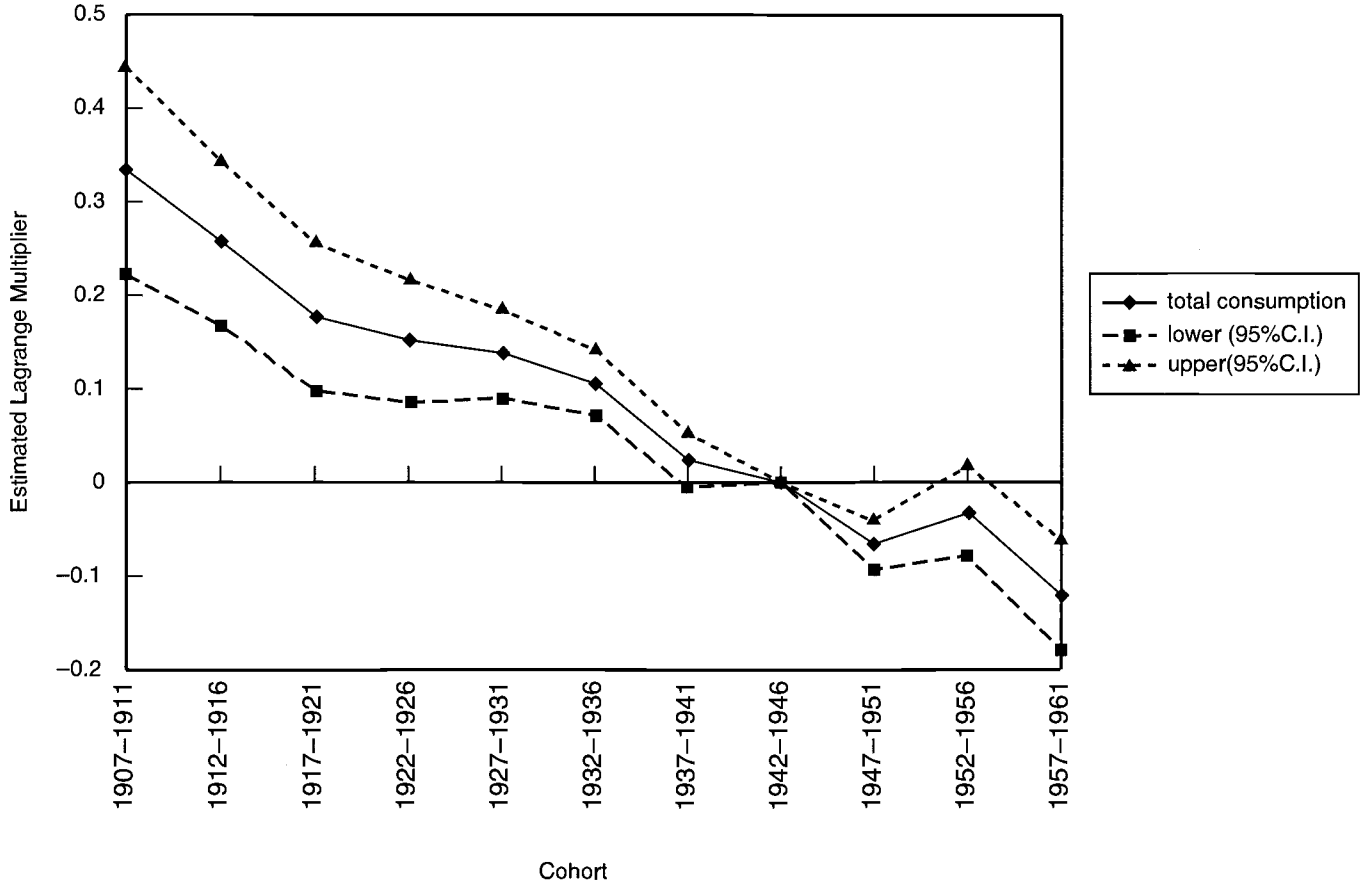

Fig. 4.9 Estimated Lagrange multipliers in the United Kingdom (cohort: 1942 − 1946 = 0)

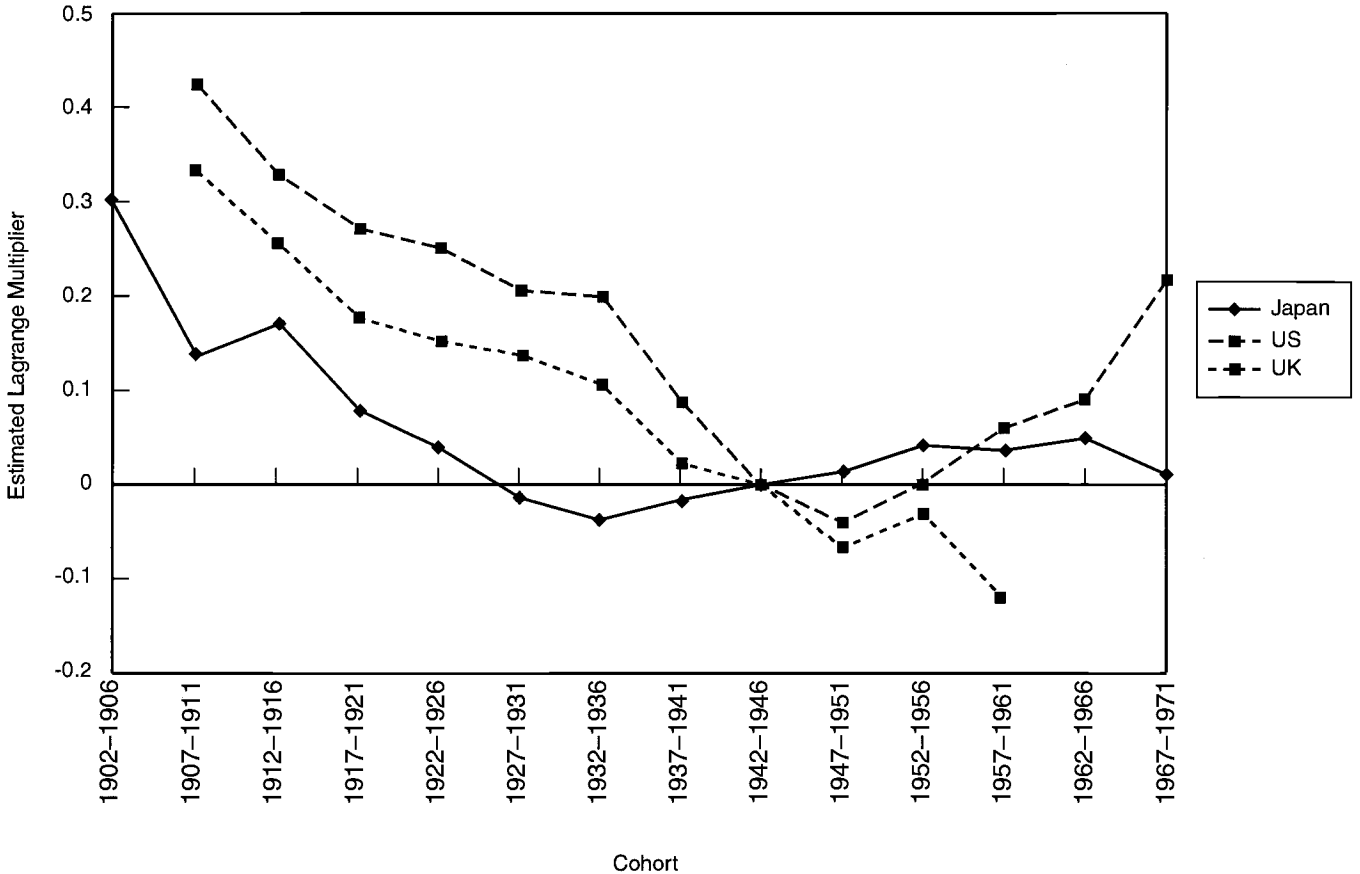

Fig. 4.10 A comparison of estimated Lagrange multipliers among Japan, the United States, and the United Kingdom (cohort: 1942 − 1946 = 0)

Table 4.11 **Estimation Results of Labor Income on Estimated Residuals**

	Total Consumption		Food		Clothes	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
			A. Workers' Households in Japan			
Relative labor income	0.013	(0.013)	0.006	(0.012)	0.031	(0.029)
Relative labor income × age dummy						
−24	0.261	(0.244)	0.402	(0.221)	0.556	(0.534)
25–29	0.187	(0.247)	0.313	(0.225)	0.901	(0.542)
30–34	0.086	(0.097)	0.063	(0.088)	0.125	(0.213)
35–39	0.042	(0.043)	0.041	(0.039)	0.049	(0.095)
45–49	−0.002	(0.052)	−0.013	(0.047)	0.014	(0.113)
50–54	0.003	(0.024)	−0.009	(0.021)	0.007	(0.052)
55–60	0.005	(0.021)	−0.002	(0.019)	0.030	(0.046)
60–64	−0.024	(0.049)	−0.006	(0.045)	0.011	(0.108)
65–	0.089	(0.153)	−0.120	(0.139)	0.522	(0.336)

			B. United States			
Relative labor income	0.006	(0.005)	0.005	(0.005)	0.019	0.010
Relative labor income × age dummy						
–24	0.057	(0.033)	0.029	(0.033)	0.052	(0.071)
25–34	−0.069	(0.154)	0.029	(0.154)	−0.110	(0.330)
45–54	−0.085	(0.084)	−0.072	(0.084)	−0.037	(0.180)
55–64	0.230	(0.112)	0.139	(0.112)	0.216	(0.241)
65–	0.008	(0.005)	0.007	(0.005)	0.020	(0.011)
			C. United Kingdom			
Relative labor income	0.003	(0.005)	0.001	(0.004)	0.008	0.011
Relative labor income × age dummy						
−29	−0.007	(0.033)	−0.004	(0.022)	−0.022	(0.068)
50–64	−0.008	(0.035)	−0.009	(0.024)	−0.038	(0.073)
65–	0.005	(0.008)	0.003	(0.005)	0.015	(0.016)

Sources: National Survey on Family Income and Expenditure (1959–94); Consumer Expenditure Survey (1972–73, 1980–94); Family Expenditure Survey (1971–91).

Before concluding this subsection, I would like to point out that the above empirical result does not necessarily contradict the fact that other papers often find the presence of liquidity constraints from microdata (Zeldes 1989). While most existing studies examine whether idiosyncratic (person-specific) shocks on labor income affect the current consumption level, my research was concerned with the effect of age-specific shocks only. This investigation, therefore, could not have examined any effect of idiosyncratic shocks because those shocks would have been cancelled by the age-classified income data.

4.5 Conclusion

This paper analyzes the distribution of economic growth among different generations and compares this intergenerational distribution in Japan, the United States, and the United Kingdom. First, I examined the evolution of the consumption distribution between young and elderly consumers. In both Japan and the United States, the youth are receiving an increasingly smaller percentage, while the British youth are receiving a larger percentage.

The paper then presents an analytical framework, which gives a theoretical interpretation to the evolution of the cross-age consumption distribution. One major advantage of this model is that it can evaluate the level of cohorts' lifetime income relative to resource availability. Using this framework, I find that the value of lifetime income has declined significantly for younger cohorts in both Japan and the United States. Such a decrease in lifetime income in younger cohorts is, however, more substantial in the United States than in Japan. By contrast, younger cohorts have received higher lifetime income in the United Kingdom.

As I suggested in the introduction, the sharp contrast between Japan and the United Kingdom or between the United States and the United Kingdom may be caused by the impact of public transfer schemes on the intergenerational wealth distribution. That is, large-scale intergenerational transfer schemes in both Japan and the United States, which may have been politically justified during the high-growth periods of the 1960s, favor the current older generation. The youth are forced to bear the costs of these welfare programs. As a consequence, the economic resources that younger cohorts are allowed to consume have increased much more slowly than aggregate resources.

The deterioration in lifetime income of the youth in Japan and the United States does not automatically imply a decline in their living standard. Moreover, the current young generation is still improving its purchasing power in terms of consumed resources. However, my calculation indicates that without sound economic growth, the living standard of future generations may be unsustainable under the existing welfare pro-

grams. Japan and the United States will be forced not only to maintain economic growth but also to reform their welfare programs, thereby changing the consumption distribution between the young and the elderly.

References

Altonji, J. G., F. Hayashi, and L. J. Kotlikoff. 1992. Is the extended family altruistically linked? Direct tests using micro data. *American Economic Review* 82: 1177–98.

Altug, S., and R. Miller. 1990. Household choices in equilibrium. *Econometrica* 58:543–70.

Atkinson, A. B. 1995. *Incomes and the welfare state: Essays on Britain and Europe.* Cambridge: Cambridge University Press.

Barro, R. J. 1974. Are government bonds net wealth? *Journal of Political Economy* 82:1095–117.

Cochrane, J. H. 1991. A simple test of consumption insurance. *Journal of Political Economy* 99:957–76.

Consumer Expenditure Survey (CES). 1972–73 and 1980–94. U.S. Department of Labor, Bureau of Labor Statistics.

Deaton, A., and C. Paxson. 1994. Intertemporal choice and inequality. *Journal of Political Economy* 102:437–67.

Family Expenditure Survey (FES). 1971–91. Office for National Statistics, U.K.

Gokhale, J., L. Kotlikoff, and J. Sabelhaus. 1996. Understanding the postwar decline in U.S. saving: A cohort analysis. *Brookings Papers on Economic Activity,* issue no. 1:315–90. Washington, D.C.: Brookings Institution.

Hayashi, F. 1995. Is the Japanese extended family altruistically linked? A test based on Engel Curves. *Journal of Political Economy* 103:661–74.

Hayashi, F., J. G. Altonji, and L. J. Kotlikoff. 1996. Risk-sharing between and within families. *Econometrica* 64:261–94.

Mace, B. J. 1991. Full insurance in the presence of aggregate uncertainty. *Journal of Political Economy* 99:928–56.

National Survey on Family Income and Expenditure (NSFIS). 1959–94. Statistics Bureau, Management and Coordination Agency, Japan.

Ohtake, F., and M. Saito. 1998. Population aging and consumption inequality in Japan. *Review of Income and Wealth* 44:361–81.

Rubinstein, M. 1974. An aggregation theorem for securities markets. *Journal of Financial Economics* 1 (1): 225–44.

Saito, M. 1997. An empirical investigation of intergenerational consumption distribution. Kyoto University. Mimeograph.

Zeldes, S. P. 1989. Consumption and liquidity constraints: An empirical investigation. *Journal of Political Economy* 97:305–46.