

Consumption and Saving: Another Glance at the Life Cycle Framework

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Abstract

This paper investigates the behavior of consumption and saving in Malaysia from the perspective of the life cycle hypothesis (LCH). Specifically, the analysis employs the Deaton-Paxson model which decomposes the pattern of household consumption and saving into age effects and cohort effects. Using the household data from three Household Expenditure Surveys of Malaysia, this study produces two key results. First, the age effects of income and consumption rise with age but the latter rise more rapidly; thus, the age effects of saving fall with age. This set of results suggests that individuals engage in a lifetime saving plan early in their working lives (which is consistent with the prediction of LCH); yet, their saving falls gradually over time and approaches zero (instead of becoming negative) toward the end of their lifetime (inconsistent with the prediction of LCH). Second, the cohort effects of income and consumption fall with cohort but the latter fall more rapidly; hence, the cohort effects of saving rise with cohort. This set of results suggests that economic boom generates an unwarranted optimism in that individuals choose to consume at the expense saving; therefore, growth stimulates consumption instead of saving (inconsistent with the prediction of LCH).

Keywords: life cycle hypothesis, consumption, saving, age effects, cohort effects.

JEL Codes: D12, D91, E21, O11.

1. Introduction

Consider a fresh college graduate who has recently assumed an entry-level management position in a manufacturing firm in his neighborhood. Being a man of reasonable vision and competence, he expects to move up the career ladder in a fairly progressive manner: becoming a junior middle-level manager in the next five years, a senior middle-level manager in the next 10 years, and eventually a top-level manager in the next 10 years (until his retirement in the next 10 years). It goes without saying that this four-stage career progression (along with the annual salary increments) would ensure a steady and generous increase in his income up to his retirement.

What is the likely lifestyle of a person characterized by this type of career path and income level? According to the life cycle theory of consumption and saving (Modigliani & Brumberg, 1954, 1980; and Modigliani & Ando, 1963), a rational and forward-looking individual maximizes his expected lifetime utility subject to his lifetime budget constraint. Such intertemporal optimization problem yields a key prediction that one's consumption is proportional to one's expected lifetime income (as opposed to one's current income as allegedly conjectured by Keynes). Because one's lifetime income is spread evenly over his lifetime, one's consumption turns out to be a fraction of his lifetime income, which implies a constant age profile of consumption. In the life cycle literature, this consumption behavior is known as consumption smoothing.

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Because one's income is expected to rise throughout his working years and drop abruptly upon his retirement, we would expect to see a hump-shaped age profile of income. Taken one's consumption and income behavior together, we observe the following: initially, one's income would be outstripped by his consumption; over time, his consumption would be outstripped by his income; upon retirement, his income would be outstripped by his consumption again. Inasmuch as saving is the difference between income and consumption, it follows that saving is negative initially, positive subsequently, and negative again upon retirement (see Attanasio & Weber, 2010; and Browning & Crossley, 2001).

Do people behave this way in terms of consumption and saving? Since the inception of the life cycle theory in the mid-1950s and its refinements in the next few decades, many attempts have been made to test the implication of consumption smoothing. The test is based on the idea that, since one's consumption is a function of one's lifetime income instead of current income, there should be no evidence of consumption-tracking-income behavior. In many empirical studies, unfortunately, scholars find that there is such evidence, thereby casting doubt on the validity of the theory (see, for example, Campbell & Mankiw, 1990; Carroll & Summers, 1991; and Deaton & Paxson, 1994).

In this paper, another attempt to validate the theory is made in the context of a developing country, Malaysia. Our point of departure is a simple model of consumption and saving developed and applied by Deaton and Paxson (1994) and subsequently applied by Paxson (1996) and Alba and See (2006), to name a few. Besides its simplicity, this model is chosen for its two remarkable features: a) its ability to test the consumption-tracking-income behavior using the so-called age effects, and b) its ability to test the link between economic growth and aggregate saving using the so-called cohort effects.

A common feature of these studies is that they are based on the household data which are compiled from the annual or periodic surveys of household income and expenditures in individual countries. Deaton and Paxson (1994) employed the household data from the *Personal Income Distribution Survey* in Taiwan during the period 1976-1990. Paxson (1996) used the household data from two developed countries (the U.S. and U.K.) and two developing countries (Taiwan and Thailand). For the U.S., the data came from the *Consumer Expenditure Survey* during the period 1980-1992. For the U.K., the data came from the *Family Expenditure Survey* during the period 1970-1992. For Thailand, the data came from the *Socio-Economic Survey* during the period 1976-1992. For Taiwan, the data were extracted from Deaton and Paxson (1994). Alba and See (2006) utilized the household data from the *Family Income and Expenditures Survey* in the Philippines during the period 1988-2000. Of these surveys, some were annual (that is, Taiwan, the U.S., and the U.K.) while others were periodic (that is, Thailand and the Philippines). For Thailand, the surveys were conducted in 1976, 1981, 1986, 1988, 1990, and 1992; for the Philippines, the surveys were conducted in 1988, 1991, 1994, 1997, and 2000.

2. A Preliminary Look at the Data

In this paper, we employ the household data from the *Household Expenditure Survey* in Malaysia during the period 1988-2010. However, the surveys were spaced roughly five years apart; in particular, the surveys were conducted in 1998/1999, 2004/2005, and 2009/2010. The number of households (or the sample size) varies from one survey to another, ranging from 8,000- to 19,000-odd observations. For each survey, however, the data sets of only one-third of the actual sample are made available to the researchers; hence, 2761, 4225, and 6495 in the first, second, and third surveys, respectively.

Each survey contains the data on income, expenditures, and demographic characteristics of the households. The income data are divided into several categories of earnings such as wage income, self-employed income, and property income. The expenditure data are divided into several major categories (nine in the first survey and 12 in the other two surveys) which, in turn, are further divided into several subcategories, up to six digits. The demographic data are divided into household- and individual-level data. At the household level, the available data include household size, number of income earners, number of dependents, and residential type. At the individual level, the available data include age, gender, ethnicity, education level, and occupation type of the household head (HHH) and members.

When it comes to the expenditure and income data, it should be noted that household expenditures constitute about 52 per cent of the household income in the first survey, about 65 per cent in the second survey, and about 58 per cent in the third survey. On average, then, household expenditures constitute about 58 per cent of the household income. These figures suggest that a crude measure of household saving is (on average) about 42 per cent of the household income, which is pretty decent.

When it comes to the expenditure data alone, it should be noted that some additional data processing needs to be made. Basically, this data processing involves two tasks. The first task is to reshuffle the nine major expenditure categories in the first survey to match the 12 major expenditure categories in the other two surveys. This discrepancy reflects the fact that certain expenditure items which are decomposed into two categories in the other two surveys are lumped together into one category in the first survey (see Table 1). For comparability, we disaggregate the expenditure items in the first survey to match those in the other two.

Table 1: Major Categories of Household Expenditures

No.	1998/1999	No.	2004/2005 and 2009/2010
1	Food and Non-alcoholic Beverages	1	Food and Non-alcoholic Beverages
2	Alcoholic Beverages and Tobacco	2	Alcoholic Beverages and Tobacco
3	Clothing and Footwear	3	Clothing and Footwear
4	House Rent and Utilities	4	House Rent and Utilities
5	House Furnishings, Equipment and Maintenance	5	House Furnishings, Equipment and Maintenance
6	Medical Care and Health	6	Medical Care and Health
7	Transportation and Communication	7	Transportation
		8	Communication
8	Recreation, Entertainment, Culture Services and Education	9	Recreation, Entertainment and Cultural Services
		10	Education
		11	Restaurants and Hotels
9	Miscellaneous Goods and Services	12	Miscellaneous Goods and Services

The second task is to derive the data on household consumption. This is accomplished by subtracting certain expenditure items that are not usually regarded as consumption from the original expenditure data. These items include mortgage payments (which are regarded as residential investment), expenditures on durable goods (which are regarded as physical capital investment), education and health expenses (which are regarded as human capital investment), and insurance payments (which are regarded as a form of saving) (see Attanasio, 1998). Once this is done, we find that household consumption constitutes an average of about 68per cent of the household expenditures and 40per cent of the household income (see Table 2). Thus, household saving constitutes an average of about 60per cent of the household income.

Table 2: Consumption Share of Expenditure and Income (per cent)

	1998/1999	2004/2005	2009/2010	Average
Consumption Share of Expenditure	60.63	71.25	71.41	67.76
Consumption Share of Income	31.69	45.98	41.17	39.60

A remarkable feature of the household survey data is that they are not of panel type, where the same groups of households are tracked over time. Instead, the data constitute a few time series of cross-sectional type. With this type of data, the best one can do is to construct a synthetic (or pseudo-) panel data based on the cohorts of households, and subsequently make an inference on the household consumption based on these household cohorts.

3. Constructing the Cohort Data

Before constructing the cohort data of households, let us explore the distribution of households by the age of HHH in all of the three surveys. As shown in Table 3, the household size varies from as small as 26 to as large as 917. Furthermore, the household size is relatively small for households with very young and old HHHs, which mimics the pattern reported in the previous cohort studies. As Paxson (1996) put it, this pattern is due to the selection into and out of the household headship for very young and very old HHHs. The existing household headship may be disrupted by marriage and job acquisition (for very young HHHs) or retirement and moving into their adult children's homes (for very old HHHs). For this reason, we impose the HHH's age restriction of 20-79 years old during the period 1998-2010 in the subsequent discussion.

Age	1998/1999	2004/2005	2009/2010
15 – 19	37	28	34
20 – 24	117	140	192
25 – 29	241	295	534
30 – 34	284	408	668
35 – 39	383	525	818
40 – 44	398	597	868
45 – 49	331	572	917
50 – 54	275	478	769
55 – 59	234	364	596
60 – 64	174	275	406
65 – 69	126	237	304
70 – 74	78	141	205
75 – 79	38	77	102
≥ 80	26	83	67
Total	2742	4223	6480

Note: Age refers to the HHH's age at the time of the survey. For each survey, the number of households is less than what was stated earlier due to the missing values on the age of some HHHs.

In the LCH literature, it is typical to define the household cohorts by the age of HHH in a given year during the sample period (Browning et al., 1985). In view of the fact that the three surveys were spaced roughly five years apart and in order to ensure that the cohorts became 5 and 10 years older in the second and third surveys, respectively, let us define the cohorts based on the HHH's age in 1999. Specifically, let the first cohort be defined as the group of households whose HHHs aged 20-24 in 1999 (so that it became 25-29 in 2004, and 30-34 in 2009); the second cohort as the one whose HHHs aged 25-29 in 1999 (so that it became 30-34 in 2004, and 35-39 in 2009); and so on until the tenth cohort as the one whose HHHs aged 65-69 in 1999 (so that it became 70-74 in 2004, and 75-79 in 2009). Then, the distribution of household cohorts in all of the three surveys can be depicted as in Table 4. A glance at the table indicates that the size of household cohorts varies from as small as 105 (the 10th cohort in 2009/2010) to as large as 896 (the fourth cohort in 2009/2010).

Cohort	Age ₁₉₉₉	1998/1999	2004/2005	2009/2010
1	20 – 24	117	296	668
2	25 – 29	228	409	832
3	30 – 34	282	526	857
4	35 – 39	368	588	896
5	40 – 44	405	575	792
6	45 – 49	338	485	597
7	50 – 54	288	366	412
8	55 – 59	229	278	308
9	60 – 64	180	226	208
10	65 – 69	130	141	105
Total		2565	3890	5675

Note: Age₁₉₉₉ refers to the HHH's age in 1999.

Given the 10 cohorts and three periods of observations, the cohort data to be generated will have 30 observations only. If we wish to increase the sample size, we need to redefine the cohort on a higher frequency basis, say, on an annual basis. Doing so increases the number of cohorts to 50 and we end up with 150 observations. However, the increase in the sample size comes at the expense of the cohort size.

The low cohort size is a cause of concern since there might be insufficient variation in the data to generate acceptable cohort means (Browning et al., 1985).

Table 5 shows that the cohort size varies from 14 (the 49th cohort in 1998/1999) to 193 (the 20th and 21st cohorts in 2009/2010).

4. Model Specification

In this paper, we follow the model of consumption and saving developed by Deaton and Paxson (1994) by stipulating that an individual's consumption is a function of the interaction between his preferences and lifetime wealth. One's preferences reflect one's needs, which evolve according to one's stage in the life cycle (that is, getting a job, getting married, having children, and so forth). Hence, one's preferences vary according to changes in his demographic characteristics such as age, household size, and household composition. One's lifetime wealth reflects one's accumulated income plus bequests (if any) throughout his working life.

Table 5: The Distribution of Household Cohorts				
Cohort	Age ₁₉₉₉	1998/1999	2004/2005	2009/2010
1	20	21	45	142
2	21	19	49	124
3	22	20	63	141
4	23	24	72	124
5	24	33	67	137
6	25	30	67	159
7	26	40	69	160
8	27	49	91	167
9	28	50	87	156
10	29	59	95	190
11	30	50	107	175
12	31	52	99	161
13	32	50	95	192
14	33	65	108	155
15	34	65	117	174
16	35	62	127	171
17	36	74	105	173
18	37	74	110	182
19	38	73	128	177
20	39	85	119	193
21	40	88	116	193
22	41	84	112	146
23	42	81	137	145
24	43	80	116	177
25	44	72	94	131
26	45	75	126	144
27	46	69	98	135
28	47	63	91	117
29	48	62	86	92
30	49	69	83	109
31	50	64	85	108
32	51	72	81	67
33	52	62	71	94
34	53	46	67	67
35	54	44	62	76
36	55	44	54	64
37	56	51	53	58
38	57	41	55	72
39	58	52	57	57
40	59	41	59	57
41	60	44	51	57
42	61	36	59	38
43	62	53	48	45
44	63	25	41	34
45	64	22	27	34
46	65	35	39	29
47	66	37	29	20

48	67	23	32	16
49	68	14	23	21
50	69	21	18	19
Total		2565	3890	5675

Note: Age₁₉₉₉ refers to the HHH's age in 1999.

From the modelling point of view, a key difference between the two is that while one's preferences vary over time, one's lifetime wealth is fixed over time. (Nonetheless, both variables vary across individuals.) Hence, a simple model of consumption can be expressed as follows:

$$c_{ijt} = \varphi_{it}(\cdot) \times W_{ij}, \tag{1}$$

where c_{ijt} denotes the consumption of individual i of cohort j at time t , $\varphi_{it}(\cdot)$ the preference function of individual i at time t , and W_{ij} the lifetime wealth of individual i of cohort j . Note that one's preferences vary across individuals and time but not across cohorts while one's wealth varies across individuals and cohorts but not across time.

The multiplicative nature of the right-hand-side variables suggests that they can be decomposed by taking logarithms, yielding:

$$\ln c_{ijt} = \ln \varphi_{it}(\cdot) + \ln W_{ij}. \tag{2}$$

One conceptual issue related to working with the cohort data is that the consumption data are available at the household (instead of individual) level. This problem is usually assumed away by treating households and individuals interchangeably (that is, i may refer to a household as well as an individual). This paper shall do the same (for an alternative treatment, see Deaton & Paxson, 2000).

Another conceptual issue related to working with the cohort data is the inability to track the same households over time. As Browning et al. (1985) put it, the best we can do is to track the same cohorts of households over time. In the LCH literature (see Deaton & Paxson (1994) and Paxson (1996)), this is accomplished by identifying the cohorts by the ages of household head (HHH) and averaging over all households which belong to the same cohorts, yielding:

$$\overline{\ln c_{jt}} = \overline{\ln \varphi_t(\cdot)} + \overline{\ln W_j}. \tag{3}$$

where the left-hand-side variable is the cohort average of the log of household consumption; that is, $\overline{\ln c_{jt}} = \frac{1}{N_j} \sum_{i=1}^{N_j} \ln c_{ijt}$, where N_j is the size of cohort j (for example, for the first cohort, there 21, 45, and 142 households for the three consecutive surveys; hence, $N_1 = 21$ in the first survey, $N_1 = 45$ in the second survey, and $N_1 = 142$ in the third survey).

Consider the second variable on the right-hand side of Eq.(3). Since the variable reflects household's lifetime wealth, which may vary across individuals and cohorts but not over time, it can be captured by the cohorts of households (see Deaton & Paxson (1994) and Paxson (1996)). Thus, a set of cohort dummies can be defined as follows:

$$COH_1 = \begin{cases} 1 & \text{if } age_{99} = 20 \\ 0 & \text{otherwise} \end{cases}; COH_2 = \begin{cases} 1 & \text{if } age_{99} = 21 \\ 0 & \text{otherwise} \end{cases}; \dots; COH_{50} = \begin{cases} 1 & \text{if } age_{99} = 69 \\ 0 & \text{otherwise} \end{cases}. \tag{4}$$

Now consider the first variable on the right-hand side of Eq.(3). Since the variable reflects household's preferences, which may vary across individuals and over time but not across cohort, t can be captured by the HHH's age (see Deaton & Paxson (1994) and Paxson (1996)). Hence, a set of age dummies can be defined as follows:

$$AGE_1 = \begin{cases} 1 & \text{if } age_t = 20 \\ 0 & \text{otherwise} \end{cases}; AGE_2 = \begin{cases} 1 & \text{if } age_t = 21 \\ 0 & \text{otherwise} \end{cases}; \dots; AGE_{60} = \begin{cases} 1 & \text{if } age_t = 79 \\ 0 & \text{otherwise} \end{cases}. \tag{5}$$

Note that age_t refers to the HHH's age at the time of the survey and age_{99} the HHH's age in 1999. Given the definitions of age and cohort dummies, Eq.(3) can be written as

$$\overline{\ln c_{jt}} = \alpha_1 + \sum_{a=1}^{60} \beta_{1a} AGE_a + \sum_{j=1}^{50} \delta_{1j} COH_j + \lambda S_j + u_1, \tag{6}$$

where t is the current year, a is the index of HHH's age, j is the index of household cohort, S is the average household size, α_i , β_i 's, and δ_i 's, and λ are parameters, and u_i is the error term.

Eq.(6) indicates that consumption of the 10 cohorts of households can be decomposed into two terms: age effects and cohort effects (Deaton & Paxson, 1994). The difference between the two is that the age effects measure the effects of the lifetime preferences of the same cohort of households on consumption, whereas the cohort effects measure the effects of the lifetime wealth of the different cohorts of households on consumption.

To illustrate, suppose we pick a 21-year-old HHH in 2000. Obviously, he belongs to the second age group, AGE₂, in 2000. If we track this person over time, we see that he moves to AGE₇ in 2005, to AGE₁₂ in 2010, and so on. Since he was 20 years old in 1999, however, he will always be in the first cohort group, COH₁. Thus, holding the cohort constant, the age effects measure the effects of the lifetime preferences of the same cohort of households on consumption.

Now suppose we pick a 32-year-old HHH in 2010. Since he must have been 21 years old in 1999, he must belong to COH₂. If we pick another 32-year-old HHH in 2005, he must have been 26 years old in 1999; thus, he must belong to COH₇. If we pick still another 32-year-old HHH in 2000, he must have been 31 years old in 1999; thus, he must belong to COH₁₂. Needless to say, all of them belong to the thirteenth age group, AGE₁₃. Thus, holding the age fixed, the cohort effects measure the effects of the lifetime wealth of the different cohorts of households on consumption. In order to determine whether the pattern of household consumption mirrors that of household income, we specify and estimate the corresponding income function as follows:

$$\overline{\ln y_{jt}} = \alpha_2 + \sum_{a=1}^{60} \beta_{2a} AGE_t + \sum_{j=1}^{50} \delta_{2j} COH_j + \lambda S_j + u_2, \tag{7}$$

where the left-hand-side variable is the cohort average of the log of household income. Other variables and parameters are as defined before.

Inasmuch as the saving rate is approximately equal to the difference between the cohort average of the log of household income and that of household consumption, $s/y \approx \overline{\ln y_j} - \overline{\ln c_j}$, the pattern of household saving can be residually calculated.

From the perspective of LCH, the age effects of consumption are relatively flat (due to consumption-smoothing behavior) while the age effects of saving are hump-shaped (because individuals borrow (or save little) when they begin employment, save (or increase their saving) as they mature, and dissave during their old age). In the face of a growing economy, the cohort effects of consumption, income, and saving are downward-sloping because the younger cohorts are relatively wealthier than the older ones.

5. Empirical Analysis

Given the household data in Malaysia for a sample of 50 cohorts observed every five years during the period 1998-2010, we estimate the models in Eqs.(6)–(7) using the OLS method.

Because we are interested in examining the age effects and the cohort effects on consumption and income, the joint tests of significance of the corresponding effects are conducted. For consumption, the joint tests of significance of the age effects and the cohort effects are determined by testing whether $H_0: \beta_{1,1} = \beta_{1,2} = \dots = \beta_{1,59} = 0$ and $H_0: \delta_{1,1} = \delta_{1,2} = \dots = \delta_{1,49} = 0$, respectively, can be rejected (and likewise for income). As shown in Table 6, the age effects and cohort effects on consumption and income are jointly significant at the 1% level.

Table 6: Estimation Results of Consumption and Income Models		
	(1)	(2)
	Consumption	Income
Household Size	0.3081***	0.1307***
Age Effects	6.8156***	4.6936***
Cohort Effects	7.6605***	5.2402***

Note: Columns (1) and (2) show the OLS estimation results of Eqs.(6) and (7), respectively. The entry Household Size indicates the estimated coefficient. The entries for Age Effects and Cohort Effects indicate the F-values; *** indicates the individual/joint significance at the 1% level.

In order to examine the pattern of the age effects on consumption, income, and saving, we plot the estimated coefficients of the age dummies from each of the above regressions. Figure 1 shows that the age effects are sloping upward for both income and consumption, signifying that both of them are rising with age. What is intriguing is that the age effects of consumption are steeper than the age effects of income, allowing them to converge toward the end of one's lifetime. As a consequence, the age effects of saving (which are residually derived) are declining with age. Given these profiles, it follows that one starts to save very dearly as soon as one begins one's employment; over time, however, one's consumption quickly catches up with one's income so that saving is exhausted toward the end of one's lifetime. Apparently, this story does not fit well into the standard life cycle model: consumption converges to income (instead of remaining flat), saving converges to zero (instead of becoming negative) toward the end of one's lifetime, and income continues to be positive (instead of falling to zero) beyond the retirement age.

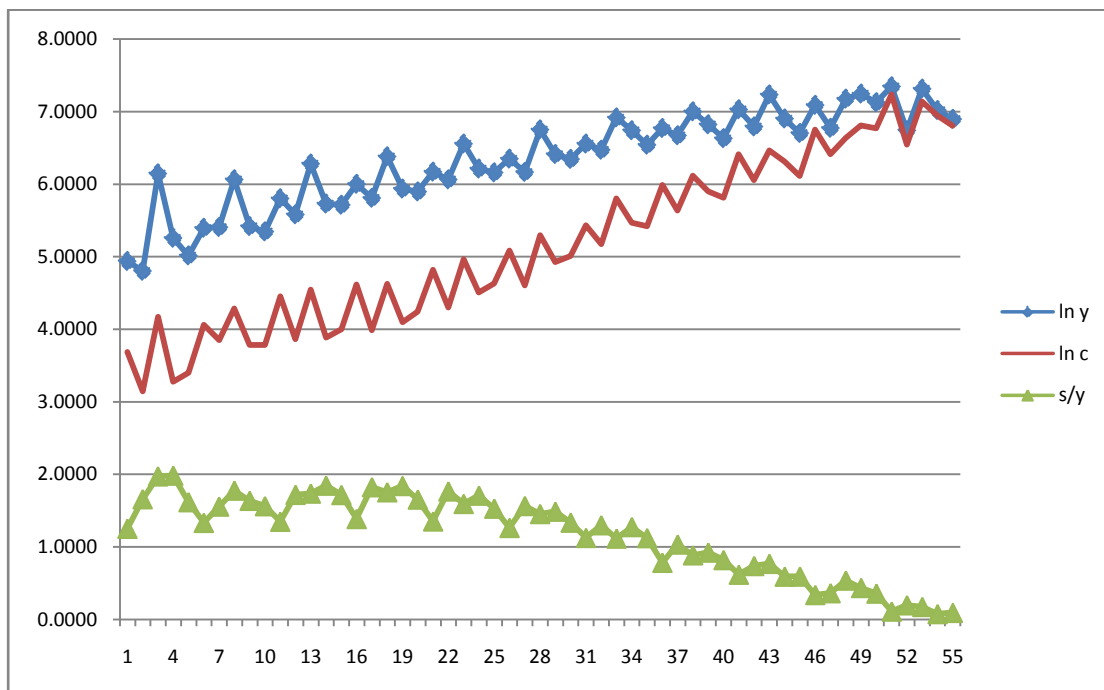


Figure 1: The Age Effects of Consumption, Income and Saving

In order to examine the pattern of the cohort effects on consumption, income, and saving, we plot the estimated coefficients of the cohort dummies from each of the above regressions. Figure 2 shows that the cohort effects are sloping downward for both income and consumption, indicating that the younger cohorts are wealthier (which is hardly surprising for a growing economy) and therefore consume more than the older cohorts (which is hardly surprising across cohorts). What is perplexing is that the cohort effects of consumption are steeper than the cohort effects of income, allowing them to converge toward the oldest cohort. As a result, the cohort effects of saving are rising with cohort. Given these profiles, it follows that as the economy grows over time, one forms an expectation that it will continue to grow; thus, one tends to consume the “extra income” at the expense of saving. Obviously, this optimistic behavior does not fit well into the standard life cycle model: in the face of a rapid economic growth, the younger cohorts consume at the expense of saving; hence, economic growth stimulates consumption instead of saving.

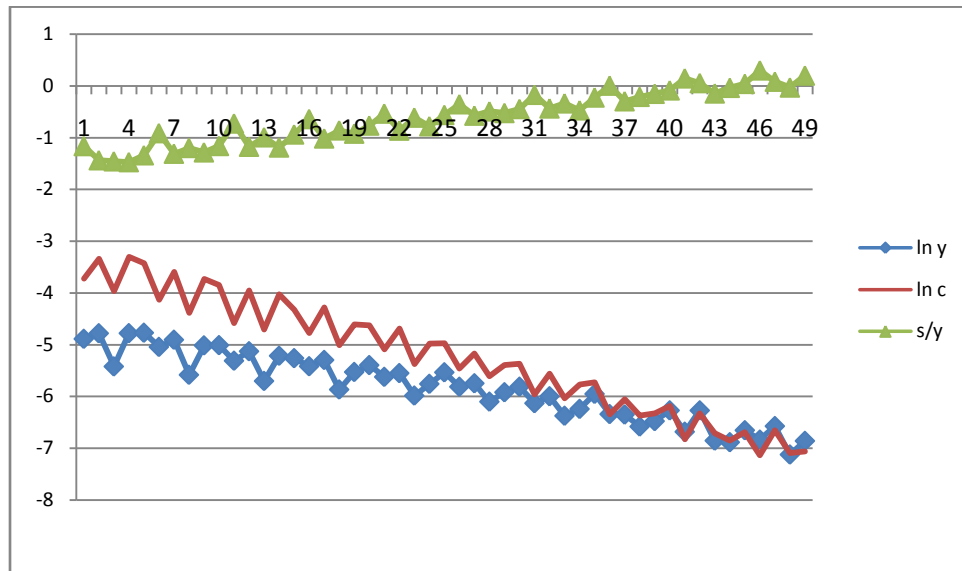


Figure 2: The Cohort Effects of Consumption, Income and Saving

6. Conclusion

In this paper, we reexamine the behavior of consumption and saving from the perspective of the life cycle hypothesis. In particular, we employ a simple model of consumption and saving developed by Deaton and Paxson (1994) which decomposes the pattern of household consumption and saving into the age effects and cohort effects. Using a sample of 50 cohorts of households in Malaysia which are tracked every five years during the period 1998-2010, we estimate the age effects and cohort effects on consumption and income (and residually calculate the age effects and cohort effects on saving). We find that both the age effects and cohort effects for each consumption and income regression are jointly significant. Graphically, we observe the following two sets of results. First, the age effects of income and consumption are rising with age but the latter is rising more rapidly; thus, the age effects of saving are falling with age. Second, the cohort effects of income and consumption are falling with cohort but the latter is falling more rapidly; hence, the cohort effects of saving are rising with cohort. The first set of results implies that individuals engage in a lifetime saving plan early in their working lives (which is consistent with the prediction of the life cycle hypothesis); yet, their saving gradually falls over time and approaching zero toward the end of their lifetime (which is inconsistent with the prediction of the life cycle hypothesis). The second set of results implies that economic boom generates an unwarranted optimism in that individuals choose to consume at the expense saving; therefore, growth stimulates consumption instead of saving (which is consistent with the prediction of the life cycle hypothesis).

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