

The Analysis on the Credit Card Bubble in Korea with the Permanent Income Hypothesis and the Liquidity Constraint

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Abstract

We examined how the Permanent Income Hypothesis (PIH) explains differences in the consumption patterns between card bubble periods and non-bubble periods with KLIPS panel data. From empirical results, with regard to the food consumption, the PIH represents significant results for the low income household, while the middle income households had the liquidity constraint. For the health and medical service consumption, all households were free from liquidity constraints except for the year when the credit card crunch occurred. For total consumption, the high income households were free from the liquidity constraint. On the other hand, the middle income households confronted a liquidity constraint. However, the low income households were free from the liquidity constraint in the card bubble periods, while the PIH was rejected in the non-bubble periods. Finally, we can argue that abolishing the ceiling on credit card cash-advance services has the same effect as eliminating borrowing constraints.

Key words: *Permanent Income Hypothesis, liquidity constraint, consumption function, card bubble*

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I. Introduction

The worldwide financial crisis, which resulted from the credit crunch of the sub-prime mortgage loan of the U.S.A. in 2008, has led to the global depression. Most countries have been trying to overcome the economic slump with both monetary and fiscal policies. As it is well-known, these two policies are basically intended to boost private consumption and investment. Although, as Yoo (2008) argues, Korea's development strategy is export-oriented, monetary and fiscal policies are important instruments to overcome the depression. To promote private consumption and investment, various policies to establish such a social safety net as subsidizing the poor and cutting the taxes have been implemented. Consumption usually forms almost 50-60 % of GDP, and was even 72% in the U.S.A. for the first half of 2007. For reference, the proportion of consumption to GDP in real terms was on average 57.6% for 1990-1997 and 51.7% for 2000-2007 in Korea. Accordingly, consumption expenditure is a significant factor of economic fluctuation.

On the other hand, at the household or the family level, household consumption may be affected by the following factors: income, wealth, expectations on future income and wealth, interest rates, age, education, family size, and even a consumer's preferences, e.g., patience or the willingness to delay gratification, a consumer's attitude toward risk, and a consumer's wish to leave a bequest. Accordingly, consumption can be seen as a function of various factors, and especially income is considered as an important factor of the consumption function. Hence, it is about time we gave some thought to the consumption function, because the effectiveness of tax cuts or

other income-boosting policies will depend on how much consumers spend or save out of an extra income caused by tax cuts or subsidies. Meanwhile, we also note the fact that most consumers face liquidity or borrowing constraints. After all, the consumption of a household depends on its liquidity constraints as well as the consumption function.

Meanwhile, liquidity or borrowing constraints are closely related to the life-cycle permanent income hypothesis since this hypothesis assumes perfect capital markets. Actually, as the capital market is imperfect, people have limitations to borrow, and thus it is not possible to spend what they want with a loan from a financial market. In other words, they cannot but consume with only the present income due to borrowing constraint when the income is temporarily reduced. Accordingly, these kinds of constraints provoked many works testing the validity of the permanent income hypothesis, specifically the life cycle permanent income hypothesis.

As a matter of fact, it had not been easy for people to have plastic money until 1999 in Korea. However, since then, the credit card companies have issued credit cards imprudently and recklessly to many people who were unable to be long-term owners. For example, the cards had been issued to even the young and single people who had no stable income, and the low-income classes who had already experienced borrowing money from relatives. Furthermore, the government had offered tax breaks to credit card users to boost consumption. Card companies promoted aggressive marketing, and did little or no credit checks when issuing plastic in accordance with the government policy. These kinds of consumption booms led to the consumption bubble. That is to say, most people did not suffer from any borrowing constraints for some time. In the end, in February 2004, credit defaulters hit a record high of 3.8

million; they did not face any liquidity constraint and spent freely.

Our study focused on consumption in Korea, which experienced weak borrowing constraints (from 2000 through the second quarter of 2002) owing to an abrupt increase in credit card users. We tested the difference of consumption patterns between the card bubble periods and non-bubble periods by using a consumption function based on the permanent income hypothesis. We can infer that there were no borrowing constraints in the bubble period (before 2002 or 2003). However, after the card bubble periods, the borrowing constraints became tighter than the previous non-bubble period (before 2000) because of the anxiety about the card bubble. Consequently, we can also infer that there was a higher possibility of borrowing constraints after the card bubble periods than before the card bubble period. Moreover, it can be assumed that low-income households were relatively less free from borrowing constraints compared with high-income households. Accordingly, we focused on whether the borrowing constraints were related to the card bubble and whether they were dependent on the level of income.

This paper is organized as follows: Section 2 discusses previous literatures. Section 3 explains the empirical models and data. Section 4 shows the status quo of the Korean credit card market and the consumption patterns for the three years analyzed, and represents the estimate results of the consumption functions. Section 5 concludes in deriving the policy implications from significant empirical findings.

II. Permanent Income Hypothesis and Previous Studies

As mentioned above, the PIH states that consumption patterns of individuals are determined not by the current income but by their long-term income expectations. This implies that transitory and short-term changes in income have little effect on consumer spending behavior. M. Friedman concluded that an individual would consume a constant proportion of his/her permanent income, thus low income earners would have higher marginal propensities to consume, whereas high income earners would have lower propensities to consume than the average propensity to consume, because they would have higher transitory elements.

There have been numerous studies on the consumption hypothesis. Of them, many works are related to the consumption function to liquidity constraints; Campbell and Mankiw (1989, 1990, 1991), Zeldes (1989), Bacchetta and Gerlach (1997), Ludvigson (1999), and Maki (2000), to name a few. Zeldes (1989) tested the PIH with the borrowing constraint using time series and cross section data. He argued that borrowing constraints are important and affect consumption. Campbell and Mankiw (1989, 1990, 1991) showed that the liquidity constraint led to the excess sensitivity to the current income from the empirical evidence of developed countries including the U.S.A. and the UK. Ludvigson (1999) relaxed assumptions in Campbell and Mankiw (1989, 1990, 1991), and assumed that all households can borrow some money to smooth consumption, but debt amount can be constrained by present income. He showed that a borrowing ceiling is restricted by income level, and has an influence on consumption. Accordingly, the deregulation of the credit market relaxes the liquidity constraint of

consumers and results in the increase of consumption. Bacchetta and Gerlach (1997) analyzed several variables to affect the liquidity status with a consumption equation, and then concluded that the variations of the household credit and the mortgage loan have statistically significant effect on consumption. Maki (2000) exposed the fact that the burden of the household debt, the portion of frozen loans, and the bankruptcy had no impact on consumption by using the error correction model. Dejuan, Seater and Wirjanto (2004) examined whether the revision of permanent income changes consumption in a same scale by using time-series data of the U.S.A. They concluded that the PIH was supported by the empirical test.

Meanwhile, several studies have been done on the consumption in Korea; Lee (1991), Cha (2000), Lim (2007), and so on. Lee (1991) estimated a consumption equation on the basis of the permanent income hypothesis, and showed that a degree of prudence shrank the present consumption. Cha (2000) tested the permanent income hypothesis with non-durable goods, and finally proved that the hypothesis is significant on food-related consumption. Lim (2007) examined with Panel Study of Income Dynamics data whether the liquidity constraint is really the main reason that the actual consumption behavior deviates from the consumption behavior under the PIH in the U.S.A. The empirical results show that the consumption of liquidity-constrained households deviates from their lifetime income and reacts directly to their current income. In conclusion, his estimation results provide strong evidence that the liquidity constraint is the reason for the empirical rejections of the PIH.

III. The Empirical Model and the Data

1. The Empirical model

The PIH assumes that a consumption decision is based on the expected discount value of lifetime resources. Accordingly, a representative individual 'i' has a lifetime utility and budget constraint as follows:

$$\text{Max} \quad E_0 \left[\sum_{t=0}^T \beta^t u(C_{it}) \right]$$

$$\text{subject to} \quad Y_{it} \geq C_{it} + A_{it+1} - (1 + r_t) A_{it}$$

Where $u(\cdot)$ is the instantaneous utility function, C_{it} is the consumption of an individual i at time t , Y_{it} is the income of individual i at time t , A_{it} is the asset of an individual i at time t , r_t is the interest rate and β means the fixed time preference.

The Lagrangian function for maximization problem of a representative individual can be expressed as follows:

$$L = E_0 \sum_{t=0}^T \beta^t \{ u(C_{it}) + \lambda_t (Y_{it} - C_{it} - A_{it+1} + (1 + r_t) A_{it}) \}$$

The Kuhn-Tucker first order condition for utility maximization is as follows:

$$(C_{it}): u'(C_{it}) - \lambda_t \leq 0, \quad C_{it} \geq 0 \quad \text{and} \quad C_{it}(u'(C_{it}) - \lambda_t) = 0 \quad (1)$$

$$(A_{it+1}): -\lambda_t + \beta(1+r_t)\lambda_{t+1} \leq 0, A_{it+1} \geq 0$$

$$\text{and } A_{it+1}(-\lambda_t + \beta(1+r_t)\lambda_{t+1}) = 0 \quad (2)$$

$$(\lambda_t) Y_{it} - C_{it} - A_{it+1} + (1+r_t)A_{it} \geq 0, \lambda_{t+1} \geq 0$$

$$\text{and } \lambda_t(Y_{it} - C_{it} - A_{it+1} + (1+r_t)A_{it}) = 0 \quad (3)$$

From equation (1), because the condition $C_{it} > 0$ should be satisfied, $u'(C_{it}) - \lambda_t$ is equivalent to 0, and thus equation (2) is substituted with the following equation.

$$-u'(C_{it}) + \beta(1+r_t)u'(C_{it+1}) \leq 0, A_{it+1} \geq 0$$

$$\text{and } A_{it+1}(-u'(C_{it}) + \beta(1+r_t)u'(C_{it+1})) = 0 \quad (4)$$

From equation (4), if $A_{it+1} > 0$, meaning that there are no liquidity constraints, the condition $u'(C_{it}) = E_0\beta(1+r_t)u'(C_{it+1})$ is realized. If there are liquidity constraints, A_{it+1} is zero and equation (4) is expressed by $-u'(C_{it}) + \beta E_0(1+r_t)u'(C_{it+1}) < 0$. Accordingly, we can rearrange equation (4) as follows;

$$-u'(C_{it}) + \beta E_0(1+r_t)u'(C_{it+1}) + s_{it} = 0$$

$$\text{or } u'(C_{it}) = \beta_i E_0(1+r_t)u'(C_{it+1}) + s_{it} \quad (5)$$

From equation (5), s_{it} is considered as a variable for liquidity constraint. Namely, in the case of $s_{it}=0$, there are no liquidity constraints, whereas in the case of $s_{it} > 0$, there exists some liquidity constraints. In other words, the higher the s_{it} , the smaller the expected utility from future consumption, which is obtained

from one unit of abandoned current consumption. In the extreme case, the future utility, which can be obtained from the abandoned current consumption, can be zero.

Equation (5) can be rewritten as follows:

$$\frac{\beta_i E_0 (1 + r_t) u'(C_{it+1})}{u'(C_{it})} + \frac{s_{it}}{u'(C_{it})} = 1$$

And then, it can be done as the following equation (6)

$$\beta_i E_0 (1 + r_t) \frac{u'(C_{it+1})}{u'(C_{it})} \left(1 + \frac{s_{it}}{\beta_i E_0 (1 + r_t) u'(C_{it+1})} \right) = 1$$

$$\beta_i E_0 (1 + r_t) \frac{u'(C_{it+1})}{u'(C_{it})} (1 + s'_{it}) = 1 \quad (6)$$

If the expectation is removed from equation (6), it is rewritten as follows:

$$\beta_i (1 + r_t) \frac{u'(C_{it+1})}{u'(C_{it})} (1 + s'_{it}) = 1 + e_{i,t+1} \quad (7)$$

We take logs of equation (7), and the following equation can be obtained:

$$\ln \left(\frac{u'(C_{it+1})}{u'(C_{it})} \right) = -\ln \beta_i (1 + r_t) - \ln(1 + s'_{it}) + \ln(1 + e_{i,t+1}) \quad (8)$$

If a utility function is defined as $u(C_{it}) = \frac{C_{it}^{1-\gamma}}{1-\gamma}$, equation (8) is expressed as:

$$\ln(C_{it+1} / C_{it}) = \frac{1}{\gamma} [\ln \beta_i (1 + r_t) + \ln(1 + s'_{it}) - \ln(1 + e_{i,t+1})] \quad (9)$$

If the time preference rate is supposed to be same as the interest rate¹, equation (9) is finally rewritten as the following:

$$\ln(C_{it+1} / C_{it}) = \frac{1}{\gamma} \ln(1 + s'_{it}) - \frac{1}{\gamma} e_{i,t+1} = \alpha \ln f(s_{it}) + u_{i,t+1} \quad (10)$$

Similarly to Lim(2007), we also use the current income² as a proxy variable for the liquidity constraints. Accordingly, the following estimation model is derived from equation (10)³:

$$\Delta \ln C_{t+1} = \alpha_1 + \alpha_2 \ln Y_t + \varepsilon_{t+1} \quad (11)$$

From Equation (11), in the case whereby there exists a liquidity constraint, as the increase in the current income raises current consumption, the growth rate of future consumption drops and thus

1. The assumption that individuals' time preference (β_t) is equal to the real interest ($1 + r_t$), is a strong restriction. However, in the case of a cross section data analysis, we also have a restriction in that we cannot obtain the interest rate data that individuals are faced with. Accordingly, we keep this assumption in our analysis
2. If the growth rate of future consumption is dependent on current income, not permanent income, we can argue that a household has a borrowing constraint. In other words, if a household has neither a liquidity nor a borrowing constraint, its consumption is not necessarily affected by current income. Therefore, current income is an indirect variable reflecting the influences of a borrowing constraint on consumption, and thus we can use current income as a proxy variable of the borrowing constraint.
3. Our model is a streamlined version of the model of Zelds (1989). In other words, the model of Zelds(1989) used the growth rate of consumption as a dependent variable, and employed current disposable income, interest rate, etc. as independent variables. Our model also used the growth rate of consumption as a dependent variable, and employed current income as an independent variable. However, our model is more simplified than Zelds(1989) by excluding independent variables of interest rate, age of household's head, etc.

α_2 has a negative sign.⁴ On the other hand, in the case whereby there are no liquidity constraints, consumption follows a random walk, and thus α_2 is statistically not significant.

2. Data

KLIPS (Korean Labor and Income Panel Study) is a longitudinal survey of the labor market and income activities of households and individuals residing in urban areas. The first wave of the KLIPS was launched by the KLI (Korea Labor Institute) in 1998, amid an unprecedented economic crisis and labor market turmoil. Being the first domestic panel survey on labor-related issues, it has served as a valuable data source for the microeconomic analysis of labor market activities and transitions, thereby contributing to the development and evaluation of labor market policies. In Korea, there are several national-level surveys on economic and labor market activities: the *Current Population Survey* and the *Special Survey of Employment* by the Korea National Statistical Office; the *Survey of Labor Mobility* and the *Basic Survey of Wages* by the Ministry of Labor. However, these surveys are all cross-sectional surveys of populations and workplaces, as opposed to longitudinal (panel) surveys.

As such, there are clear data limitations for in-depth analytic studies of labor force supply and mobility, including schooling and

4. We also estimate the consumption function using the growth rate of income as the proxy variable of a borrowing constraint as follows:

$$\Delta \ln C_{t+1} = \alpha_1 + \alpha_2 \Delta \ln Y_t + \varepsilon_{t+1}$$

However, the estimation results accept the PIH strongly in the whole period without regard to the card bubble crunch. Accordingly, we represent the estimation result for just reference in the Appendix.

the school-to-work transition of youth, job mobility and labor market transition processes, unemployment experiences, job training and education, working conditions and welfare, childcare and female labor force participation, income and consumption, health and retirement, etc. KLIPS was introduced with the objective to fill in these data gaps which occurred in the academic and policy studies on economic and labor market activities of individuals and households. In designing and managing KLIPS, our role models are a set of very successful longitudinal surveys conducted in industrialized countries, such as NLS (1968-), NLSy (1979-), PSID (1968-) of USA, SLID (1993-) of Canada, BHPS (1991-) of the UK, and GSOEP (1984-) of Germany, among many others.

We made a balanced panel from 2001 of the fifth wave to 2006 of the tenth wave. 2,457 households were surveyed over a period of six consecutive years. Current income is categorized into five, i.e., labor income, business income, financial income, real estate income, transfer income. With regard to the consumption, KLIPS has surveyed the following: expenditure for food, dining-out, public and private education, automobile maintenance, housing, weddings and funerals, health and medical services, cultural activities, and communications. We apply three variables of the current income, the total sum of ten consumptions, and the sum of the food and dining-out to Equation (10).⁵ The last one has been widely used in previous studies (Lim, 2007).

5. The deflator, which converts nominal term into real term, is not variable but constant in the cross section data. In other words, the prices that all households are confronted with in the same year are the same. Accordingly, it is supposed that there is not a significant difference between real term and nominal term, and thus we use nominal data to analyse the consumption.

IV. Consumption Pattern and Empirical Results

1. The Patterns of Consumption and Credit Card Use in Korea

We will discuss descriptive statistics from the KLIPS panel dataset. The current income increases year by year (see Table 1). The highest growth rate in the income is 29.1% in 2001. The growth rates are 10.9% and 13.9% in 2003 and 2004, respectively. It is noteworthy that the growth rate of total consumption shows 8.2% in 2001 and 4.9% in 2002, when plastic holders increased sharply. In this context, food expenditure had increased during 2001 and 2002, which is much higher than the other years, showing 0~1 percent or still less negative.

Let us begin with the number of cardholders to understand the consumption bubble caused by the card (see Table 2). The number of credit cards per working population reached a new high in 2002, which was 54.3% higher than previous ones. It has decreased since then. The cumulative numbers of credit cards plunged to 104.8 million as of the end of 2002, up about 15 million from early in the year. However, since the second quarter of 2002 when it hit a record high of 3.8 million in February, the excessive use of the credit card caused them to become credit defaulters in 2004. This is called “bursting the consumer credit bubble”. The GDP growth rates in real terms have decreased since then. The growth rate of real GDP decreased to 2.8% in 2003 from 7.2% in 2002 (the base year is 2000). Actually, the rate in 1998 when the economic crisis broke out, was -6.9%, after then, the rates increased to 9.5% in 1999, 8.5% in 2000, 4.0% in 2001, 4.6% in 2004 (whose base year is 2000).

Table 1. Descriptive Statistics by Year

(Unit: Korean ten thousand won, %)

	Current Income	Total Consumption	Food Consumption
2000	2,042 (1,865)	1,239 (849)	452 (263)
2001	2,593 (3,308) (29.1%)	1,328 (853) (8.2%)	457 (251) (3.3%)
2002	2,706 (2,705) (2.7%)	1,419 (921) (4.9%)	465 (273) (0.9%)
2003	2,894 (2,962) (10.9%)	1,414 (880) (0.2%)	467 (274) (0.0%)
2004	3,082 (3,331) (13.9%)	1,462 (924) (2.8%)	455 (272) (-2.7%)
2005	3,249 (2,989) (6.6%)	1,507 (1,048) (0.9%)	449 (258) (-2.0%)
2006	3,494 (3,920) (3.8%)	1,553 (1,069) (2.6%)	456 (271) (1.1%)

Note: Parenthesis in the second row refers to the standard deviation. Parenthesis in the third row refers to the growth rate. The statistics are based on the survey data of 2,457 households from KLIPS (Korean Labor and Income Panel Study)

Second, Park (2005) analyzed the trends of the propensity to consume after the Korean financial crisis, and found that MPC and the average propensity to consume (hereafter, APC) are excessively high between 2000 and 2002. He calculated MPC, which was -145.9% in 1998, 192.3% in 1999, 218.2% in 2000, 138.7% 2001, and 146.2% in 2002, which had become unusually high since 1999. He referred to the problem as an “open question” to be solved in the near future. Also, APC had been increasing sharply and remained at the higher level through 1999-2001 when consumption had been increasing rapidly due to the over-issuing of credit cards in 1999,

but it decreased from the second quarter of 2002. Third, Park (2005)'s claim is partly supported by the time series data, which showed the growth rates of nominal consumption reaching 10% in 2001 and 11% in 2002, respectively. This is because most people expended indiscreetly with the credit card, meaning the relaxation of the borrowing constraint or the liquidity constraint. In the end, it seems that the reckless over-consumption provoked the credit card crunch in 2002.

Table 2. The Number of Cardholders

(Unit: Thousand Persons, %)

Year	Working Population (A)	Rate of Change (%)	# of Cardholders (B)	Rate of Change (%)	B/A
2001	22,417	-	89,930	-	4.0
2002	22,877	2.1	104,807	16.5	4.6
2003	22,916	0.2	95,517	-8.9	4.1
2004	23,370	2.0	83,456	-12.6	3.6
2005	23,743	1.6	82,905	-0.7	3.5
2006	23,978	1.0	91,149	9.9	3.8
2007	23,993	0.1	89,565	-1.7	3.7

Table 3. Trends of Private Debt and Private Debt to the Private Assets

(Unit: Korean Trillion Won, %)

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total Sum	211.2	183.6	214.0	266.9	341.7	439.1	447.6	474.7	506.2
Private Asset(A)	616.8	672.0	730.5	798.5	878.7	975.9	1025.9	1082.1	1141.9
Private Debt(B)	300.1	269.9	293.0	329.3	398.7	505.1	529.9	555.8	596.0
B/A(%)	48.7	40.2	40.1	41.2	45.4	51.8	51.7	51.4	52.2

Data Source: Bank of Korea DB

In relation to the credit card crunch, we will discuss the trends of the ratio of the debt to the asset (see Table 3). In 2000 when credit card issuance was starting to be more than expected, the total sum of household credit amounted to about 267 trillion Korean won, 342 trillion Korean won in 2001, 439 trillion Korean won in 2002, whose growth rate reached the annual rate of 28%. In particular, the ratio of the private debt to the private assets increased sharply from 45.4% in 2001 to 51.8% in 2002, showing the rapid growth of household debt.

2. Empirical Results

As mentioned above, we tested the permanent income hypothesis by using Equation (10). In order to test the hypothesis, we used the longitudinal panel data of the total consumption, the food consumption, health and medical service consumption and the current income, obtained from 2,457 households who had been surveyed for seven consecutive years. Growth rates of consumption were computed by taking the log difference between the consumption of the two periods for every household. The households were divided into three groups:⁶ high income households, middle income households and low income households. Accordingly, the consumption functions of the three groups and whole households were estimated by using the OLS (Ordinary Least Square) from year 2000 to year 2005.⁷

6. The households are classified in three income groups by average income from 2001 to 2006 according to a conventional way. Namely, Low income, middle income and high income are defined as under $0.5 \times \text{Median of Average Income}$, between $0.5 \times \text{Median of Average Income}$ and $1.5 \times \text{Median of Average Income}$, and over $1.5 \times \text{Median of Average Income}$. Accordingly, the numbers of high income households, middle income household and low income households are 636, 1,290 and 531, respectively.

Table 4 shows the regression results of the consumption function in which food consumption of high income, middle income, low income and all households are used as dependent variables.⁸ First, for high income households, the liquidity constraint occurred in 2000, 2004 and 2005, and thus the PIH is rejected during those periods. In particular, the liquidity constraint was strengthened from 2004. The liquidity constraint was weakened in 2001, 2002 and even 2003 when the regulation on the use of credit cards was strengthened. In food consumption, it is considered that the high income households were not completely free from the credit card crunch. Second, for middle income households, the present income affected the growth rate of food consumption in 2001, and 2003 to 2005. To note is that the liquidity constraint was strengthened in 2001 when the regulation on credit cards was weakened. In other words, the middle income households were continuously affected by the liquidity constraint in food consumption.

Third, for low income households, the present income affected the growth rate of food consumption in 2000 and 2005. For low income households, the liquidity constraint for food consumption was not significant even in the period that was related to the credit card crunch. The reason that the low income households were not under a liquidity constraint in food consumption is because food is a very important necessity for low income households. Accordingly, the food consumption is not sensitive to the present income.

7. The GMM and GLS are useful methods to solve the problem of heteroskedasticity and endogeneity. However, in our analysis, the estimation results of GMM show many defects.

8. The real estate bubble is very an important factor influencing consumption. Accordingly, it can be considered that total asset holdings are introduced in the estimation model of further studies.

Table 4. The Regression Result: Food Consumption

	Year Variables	$\Delta \ln FC_{t+1}$					
		2000	2001	2002	2003	2004	2005
High Income Households	C	0.892** (3.75)	0.360 (1.10)	0.187 (0.71)	0.092 (0.37)	0.664* (1.97)	1.084** (3.15)
	$\ln Y_t$	-0.102** (-3.41)	-0.044 (-1.13)	-0.011 (-0.37)	-0.018 (-0.62)	-0.078* (-1.99)	-0.123* (-3.09)
Middle Income Households	C	0.037 (0.32)	0.766** (3.86)	-0.110 (-0.89)	0.484** (2.86)	0.430* (1.80)	0.655** (2.80)
	$\ln Y_t$	-0.004 (-0.25)	-0.097** (-3.69)	0.013 (0.78)	-0.066** (-2.99)	-0.058* (-1.87)	-0.086** (-2.87)
Low Income Households	C	0.276* (2.35)	0.120 (1.17)	-0.120 (-0.98)	0.255 (1.51)	0.169 (0.67)	0.477* (2.06)
	$\ln Y_t$	-0.038* (-1.99)	-0.024 (-1.43)	0.006 (0.29)	-0.044 (-1.62)	-0.036 (-0.93)	-0.066* (-1.85)
Whole Households	C	0.180* (2.45)	0.190* (2.38)	-0.203* (-2.91)	0.238* (2.94)	0.035 (0.34)	0.364* (3.71)
	$\ln Y_t$	-0.020* (-1.97)	-0.024* (-2.25)	0.027 (2.93)	-0.036** (-3.35)	-0.008 (-0.57)	-0.046** (-3.65)

Note: Y_t : Income, FC_t : Food Consumption, The models are estimated by OLS, Parenthesis is t-value. *, ** mean the significance level of 5% and 1%, respectively (+ implies the significance level of 10%).

Table 5. The Test Result: Health, Medical Service Consumption

	Year Variables	$\Delta \ln SC_{t+1}$					
		2000	2001	2002	2003	2004	2005
High Income Households	C	0.980 (1.40)	-0.362 (-0.37)	-0.436 (-0.55)	2.630** (2.65)	0.170 (0.13)	0.886 (0.78)
	$\ln Y_t$	-0.080 (-0.91)	0.047 (0.40)	0.037 (0.39)	-0.291* (-2.49)	-0.026 (-0.17)	-0.083 (-0.63)
Middle Income Households	C	0.166 (0.55)	0.389 (0.68)	0.797* (1.85)	0.057 (0.11)	-0.454 (-0.72)	1.415 (2.06)
	$\ln Y_t$	0.005 (0.12)	-0.047 (-0.62)	-0.121* (-2.14)	0.003 (0.04)	0.059 (0.73)	-0.162* (-1.85)
Low Income Households	C	0.280 (0.88)	-0.128 (-0.44)	0.136 (0.51)	0.879* (2.54)	0.463 (0.86)	0.284 (0.55)
	$\ln Y_t$	0.008 (0.16)	0.026 (0.55)	-0.034 (-0.79)	-0.136* (-2.44)	-0.056 (-0.66)	-0.043 (-0.54)
Whole Households	C	0.299 (1.50)	-0.014 (-0.06)	0.233 (1.12)	0.369 (1.58)	0.324 (1.17)	0.101 (0.37)
	$\ln Y_t$	-0.005 (-0.16)	0.006 (0.19)	-0.046* (-1.68)	-0.036 (-1.19)	-0.041 (-1.13)	0.003 (0.09)

Note: Y_t : Income, SC_t : Health, Medical Service Consumption, The models are estimated by OLS, Parenthesis is t-value. *, ** mean the significance level of 5% and 1%, respectively (+ implies the significance level of 10%).

Overall, liquidity constraints for food consumption appeared in the whole period except for 2002 and 2004. Overall, in food consumption, effects of liquidity constraints that were related to the credit card crunch were most clearly shown on the high income households. A remarkable feature is that the liquidity constraint has been strengthened since 2003. This indicates that the liquidity constraint is not temporary phenomenon in only 2003 in the food consumption.

Table 5 exhibits the regression results of consumption function in which the health and medical service consumption of the high income households, the middle income households, the low income households and all households are used as dependent variables. First, for high income households, the present income had an effect on the growth rate of the health and medical service consumption in 2003 only. This means that the high income households and the low income households were temporarily confronted with the liquidity constraint caused by the credit card crunch. Second, for the middle income households, the liquidity constraint was realized one year earlier than the high income households. However, differently from the food consumption, the liquidity constraints occurred for just one year in 2002 or 2003. This implies that the liquidity constraints in the medical service consumption were temporary shocks caused by the credit card crunch.

Table 6 presents the regression results of the consumption function in which the total consumption of the high income households, the middle income households, the low income households and all households are used as dependent variables. First, for high income households, the present income had no effect on the growth rates of total consumption in 2001 to 2005. However, the present income had a significant effect on the growth rate of

total consumption in 2000 when the economic slump was experienced. Accordingly, it is clear that the total consumption of the high income households was not affected by the borrowing constraint and the credit card crunch.

Table 6. The Test Result: Total Consumption

	Year Variables	$\Delta \ln C_{t+1}$					
		2000	2001	2002	2003	2004	2005
High Income Households	C	0.528** (3.16)	0.057 (0.28)	-0.192 (-1.20)	0.302+ (1.80)	0.376+ (1.75)	0.179 (0.61)
	$\ln Y_t$	-0.051* (-2.43)	0.001 (0.02)	0.026 (1.37)	-0.031 (-1.58)	-0.040 (-1.59)	-0.018 (-0.54)
Middle Income Households	C	0.010 (0.13)	0.427** (3.67)	0.396** (4.28)	0.378** (3.55)	0.248 (1.57)	0.718** (4.88)
	$\ln Y_t$	0.011 (1.16)	-0.049** (-3.20)	-0.052** (-4.26)	-0.045** (-3.25)	-0.032 (-1.56)	-0.089** (-4.72)
Low Income Households	C	0.223** (2.98)	0.048 (0.73)	-0.074 (-1.11)	0.180+ (1.90)	0.328* (2.23)	0.447** (2.94)
	$\ln Y_t$	-0.032** (-2.61)	-0.007 (-0.65)	0.008 (0.77)	-0.029+ (-1.93)	-0.051* (-2.25)	-0.065** (-2.78)
Whole Households	C	0.088+ (1.85)	0.058 (1.19)	0.008 (0.18)	0.123* (2.48)	0.085 (1.30)	0.256** (3.81)
	$\ln Y_t$	0.000 (0.01)	-0.001 (-0.21)	-0.001 (-0.09)	-0.013+ (-1.95)	-0.010 (-1.15)	-0.030** (-3.47)

Note: Y_t : Income, C_t : Total Consumption, The models are estimated by OLS, Parenthesis is t-value. *, ** mean the significance level of 5% and 1%, respectively (+ implies the significance level of 10%).

Second, for the middle income households, the present income had effects on the growth rate of total consumption in 2001 to 2005 except for 2004. Accordingly, it is proved that the middle income households had confronted the liquidity constraint. In other words,

the middle income households have the low portion of temporary income to permanent income, and thus the present income is not much different from the permanent income which affects the present consumption. As a result, the increase of present income raises the present consumption, and then decreases the growth rate of the future consumption.

Third, for low income households, the present income significantly affected the growth rate of total consumption in 2000, and 2003 to 2005. However, the present income had no significant effect on the growth rate of consumption in 2001, and 2002 when the use of the credit card was wide spread. In other words, the low income households could be free from the liquidity constraint only in 2001, and 2002 through the use of credit cards. In short, the liquidity constraints have been strengthened for the low income households since the credit card crunch. Overall, it is thought that the liquidity constraint was sharply expanded in 2003. The liquidity constraint was weakened more or less in 2004, and then again strengthened in 2005. Hence, we also argue that the whole households have been faced strongly with the borrowing constraints because of the credit card crunch.

V. Summary and Concluding Remarks

We examined how different the permanent income hypothesis explains consumption patterns between the card bubble periods for 2000 ~ 2002 and non-bubble periods in Korea after 2003 with the KLIPS panel data.

We found out several significant findings from empirical results;

first, with regard to the food consumption, the PIH represents significant results for the low income household, while the middle income households did not have the liquidity constraint in 2002, when the card bubble was at its peak. This implies that food consumption is a very important necessity for the low income households. Second, for the health and the medical service consumption, all households of the high, the middle and the low income were free from liquidity constraints. Even the low income households did not have the liquidity constraint, which is inferred because the low income households spend on only the essential and minimum health and medical services.

Nevertheless, every income household experienced temporal liquidity constraints during the credit card crunch. Third, for total consumption, the high income households were free from the liquidity constraint in both card bubble periods and non-bubble periods (including the credit card crunch), and thus accepted the PIH. On the other hand, the middle income households were confronted with the liquidity constraint in both card bubble periods and non-bubble periods (including the credit card crunch), meaning that the PIH was rejected. However, the low income households were free from the liquidity constraint in card bubble periods, while the PIH was rejected in non-bubble periods. Moreover, the borrowing constraints have been strengthened since the credit card crunch. Finally, we can say that abolishing the ceiling on credit card cash-advance services can be functioned as no borrowing constraints (Ludvigson, 1999) and thus most people spend as they want during those years with the plastic money. Furthermore, the credit card bubble and the credit card crunch do not have the same effect on all income classes. Overall, it was estimated that the low income households were most sensitive to the liquidity constraint. Note that our conclusion can be

generalized if these empirical results can be supported by the macro-data like GDP, private consumption, and so on.

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Appendix

Table A-1. The Regression Result: Food Consumption

	Variables Year	$\Delta \ln C_{t+1}$					
		2000	2001	2002	2003	2004	2005
High Income Households	C	0.096** (3.13)	0.009 (0.31)	0.090** (3.28)	-0.067** (-3.43)	-0.001 (-0.04)	0.023 (1.08)
	$\Delta \ln Y_t$	-0.045* (-2.01)	-0.044+ (-1.75)	0.020 (0.67)	0.017 (0.85)	-0.057* (-2.07)	-0.069+ (-1.77)
Middle Income Households	C	0.010 (0.43)	0.046* (2.23)	-0.015 (-0.90)	-0.021 (-1.17)	-0.014 (-0.73)	-0.009 (-0.52)
	$\Delta \ln Y_t$	0.009 (0.64)	-0.023+ (-1.68)	0.022 (1.47)	0.012 (0.77)	-0.013 (-0.60)	-0.063* (-2.55)
Low Income Households	C	0.050 (1.49)	-0.020 (-0.67)	-0.085* (-2.46)	-0.013 (-0.35)	-0.068* (-1.85)	0.053 (1.59)
	$\Delta \ln Y_t$	-0.017 (-0.98)	0.006 (0.47)	-0.013 (-0.72)	0.005 (0.28)	0.020 (0.81)	-0.002 (-0.05)
Whole Households	C	0.039* (2.40)	0.017 (1.18)	-0.002 (-0.18)	-0.031* (-2.30)	-0.022* (-1.62)	0.012 (0.94)
	$\Delta \ln Y_t$	-0.008 (-0.80)	-0.013 (-1.39)	0.005 (0.44)	0.009 (0.92)	-0.005 (-0.39)	-0.041* (-2.33)

Note: Y_t : Income, FC_t : Food Consumption, The models are estimated by OLS, Parenthesis is t-value. *, ** mean the significance level of 5% and 1%, respectively(+ implies the significance level of 10%).

Table A-2. The Test Result: Health, Medical Service Consumption

	Year Variables	$\Delta \ln C_{t+1}$					
		2000	2001	2002	2003	2004	2005
High Income Households	C	0.353** (3.94)	0.026 (0.28)	-0.132 (-1.58)	0.177* (2.30)	-0.033 (-0.44)	0.174* (2.44)
	$\Delta \ln Y_t$	-0.027 (-0.42)	0.001 (0.01)	0.077 (0.84)	-0.088 (-1.12)	-0.155 (-1.48)	-0.118 (-0.92)
Middle Income Households	C	0.204** (3.43)	0.035 (0.58)	-0.115* (-2.06)	0.080 (1.47)	0.001 (0.02)	0.161** (3.23)
	$\Delta \ln Y_t$	0.025 (0.65)	0.000 (0.01)	-0.068 (-1.33)	-0.023 (-0.47)	0.027 (0.49)	-0.100 (-1.37)
Low Income Households	C	0.334** (3.72)	0.024 (0.28)	-0.064 (-0.86)	0.055 (0.71)	0.139+ (1.78)	0.010 (0.13)
	$\Delta \ln Y_t$	0.033 (0.70)	-0.011 (-0.29)	-0.018 (-0.47)	0.011 (0.26)	-0.094+ (-1.79)	-0.019 (-0.25)
Whole Households	C	0.268** (6.18)	0.031 (0.74)	-0.107** (-2.70)	0.098* (2.53)	0.019 (0.51)	0.131** (3.65)
	$\Delta \ln Y_t$	0.019 (0.71)	-0.004 (-0.15)	-0.024 (-0.80)	-0.016 (-0.54)	-0.045 (-1.24)	-0.070 (-1.43)

Note: Y_t : Income, C_t : Total Consumption, The models are estimated by OLS, Parenthesis is t-value. *, ** mean the significance level of 5% and 1%, respectively (+ implies the significance level of 10%).

Table A-3. The Test Result: Total Consumption

	Year Variables	$\Delta \ln SC_{t+1}$					
		2000	2001	2002	2003	2004	2005
High Income	C	0.130** (6.06)	0.069** (3.68)	0.024 (1.41)	0.034** (2.61)	0.036** (2.90)	0.020 (1.11)
	$\Delta \ln Y_t$	-0.022 (-1.39)	-0.019 (-1.21)	0.058** (3.16)	0.023+ (1.75)	-0.016 (-0.92)	0.017 (0.50)
Middle Income	C	0.092** (6.50)	0.056** (4.64)	0.006 (0.46)	0.034** (3.02)	0.002 (0.17)	0.029** (2.67)
	$\Delta \ln Y_t$	0.008 (0.84)	0.001 (0.16)	-0.017 (-1.58)	-0.008 (-0.79)	-0.004 (-0.32)	-0.039* (-2.46)
Low Income	C	0.035 (1.63)	0.007 (0.39)	-0.025 (-1.31)	0.000 (0.02)	0.007 (0.31)	0.030 (1.35)
	$\Delta \ln Y_t$	-0.004 (-0.40)	0.006 (0.62)	0.001 (0.08)	0.011 (1.03)	-0.017 (-1.16)	-0.028 (-1.23)
Whole Households	C	0.088** (8.54)	0.047** (5.29)	0.004 (0.49)	0.027** (3.31)	0.012 (1.35)	0.027** (3.03)
	$\Delta \ln Y_t$	-0.001 (-0.08)	0.002 (0.29)	0.001 (0.19)	0.005 (0.86)	-0.012 (-1.36)	-0.026* (-2.17)

Note: Y_t : Income, SC_t : Health, Medical Service Consumption. The models are estimated by OLS, Parenthesis is t-value. *, ** mean the significance level of 5% and 1%, respectively (+ implies the significance level of 10%).