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Household Debt and Consumer Spending in Korea: Evidence from Household Data[†]

By YOUNG IL KIM AND MIN HWANG*

Household debt in Korea raises concerns about the resilience of the economy due to its size and quality. Against this backdrop, we investigate if household leverage matters for private consumption in adverse economic environments even without severe financial disruptions. We find that the balance sheet positions in terms of the leverage ratio may weaken consumption growth. We also find that the depressive effect of debt on consumption may differ across types of consumer spending and household characteristics. In particular, the effects of indebtedness have been much stronger in relation to durable goods expenditures than in other areas. In addition, debtors in high-income (wealth) groups have also shown downward adjustments in consumption even more so than low-income (wealth) groups. These findings imply that debtors' precautionary behavior may serve as an important channel from leverage to consumer spending.

Key Word: Household debt, Consumption, Leverage

JEL Code: D12, E21, E30

I. Introduction

Household debt in Korea has raised concerns about economic resilience as the accumulated debt has been large relative to income (or GDP) when compared to many other countries. The Korean economy entered a deep recession at the onset of the global financial crisis of 2007-09 and then slowed down again in 2011-13 after a very short-lived recovery in 2010. Consumption growth was also very weak during the two periods of adverse macroeconomic conditions. It is often claimed that the high leverage of the household sector may drag down domestic demand, but without much empirical evidence. Against this backdrop, we investigate if

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household balance sheet positions have aggravated private consumption in the face of contractionary developments in the economy.

Consumer spending may differ between households with high and low leverage, as high leverage may hinder households from increasing consumption expenditures, especially in times of adverse economic conditions. Highly leveraged households may show weaker consumption growth compared with other households because they may behave in a more precautionary manner out of fear of financial distress in the future or worry over limited access to credit. We ask in the current study how heterogeneity in household balance sheet positions in terms of leverage may explain the difference in the strength of consumer spending, especially under adverse macroeconomic conditions even with appropriately controlling for the common determinants of consumption, such as income, wealth and other relevant factors. In addition, we analyze various aspects of the debt-consumption relationship across different types of consumption and household characteristics for the two adverse economic environments in 2007-09 and 2011-13.

We find arguments in previous studies holding that household indebtedness matters with regard to consumer spending. Mishkin (1976, 1977, 1978) argues that the composition of household balance sheets influences the spending decisions of the household, especially on illiquid assets such as durable goods and house purchases. For example, household obligations such as a high debt burden would depress the demand for consumer durables even if the net worth remains constant. King (1994) argues that household indebtedness can destabilize the real economy by depressing aggregate consumption. Eggertsson and Krugman (2012) also show that a large deleveraging shock may induce debtors to reduce consumption by a large amount while savers (or creditors) may not increase their consumption enough to compensate for the consumption decline by debtors under some circumstances. Betti *et al.* (2007) argue that too much debt accumulation based on erroneous beliefs about the future would result in adjustments in consumption expenditures if the beliefs or expectations about future incomes were shown to be false by actual outcomes.

Based on the above theoretical arguments, we analyze at the household level how heterogeneity in the leverage of households or in their balance sheet compositions affects the consumption behavior, *ceteris paribus*, i.e., conditional on other common determinants of consumption. Consumption may be determined by income (Y), wealth (NW), and household characteristics according to previous studies. In addition to the common determinants, the analysis conducted here examines if household leverage can exert downward pressure on consumption expenditures in the event of adverse macroeconomic developments.

We find that highly leveraged households tended to show weaker consumption growth compared with other households in the recession driven by the global financial crisis as well as in the recent economic slow-downs without much financial disruptions. In other words, weakness in the balance sheet position may exert downward pressure on household consumption in times of adverse macroeconomic conditions with high uncertainty about the future. In addition, we find that household leverage had much stronger effects on durable goods purchases than nondurable consumption, confirming based on a household-level analysis Mishkin's (1976)

argument about the depressive effects of debt on consumer durables. We also find depressive effects of leverage on consumption in both low-income (wealth) and high-income (wealth) households, with the effects even stronger in the latter group. This result suggests that debtors' precautionary responses may have played an important role in their weak consumption growth amid the worsening economic conditions with uncertainty and looming associated economic prospects.¹ In addition, we find that the effects of household leverage on consumption were greater in 2011-13 than in 2007-09. The weakness in consumption growth shown by leveraged households even in the less disruptive macroeconomic environment in more recent years (2011-13) suggests that households' balance sheet positions during these recent events may be more depressing with respect to private consumption. It is important to note that the rising share of highly leveraged households in combination with the depressive effect of leverage may exert greater downward pressure on private consumption if the economy is hit by severe shocks. From a policy perspective, the current study suggests that attention may be warranted with regard to the soundness of household balance sheets for the real economy, especially in times of worsening economic conditions.

The current study is closely related to those by Dynan (2012), Andersen *et al.* (2014), and Son and Choi (2015) in that it undertakes an investigation of the debt-consumption relationship based on household data with similar empirical methods. These earlier works all focus on the recessionary environment due to the global financial crisis (2007-09). In contrast, we show that leveraged households adjusted their spending not only during the deep recession driven by the global financial crisis (2007-09) but also during the decelerating economic environment in its aftermath (2011-13). In other words, the weak balance sheet positions of households may matter for the real economy during worsening economic environments even without severe disruptions in financial markets or intermediaries. We find that the effect of leverage on consumption growth was even stronger during the decelerating economic environment of 2011-13 than it was during the recession of 2007-09. In addition, we show how the depressive effect of household debt on consumption may differ across different types of consumer spending and household characteristics, as mentioned above. In particular, we find that household indebtedness has a stronger effect on consumer durables than on non-durables. In addition, the downward adjustment in consumption expenditures is strong even for high-income (wealth) households, suggesting that debtors' precautionary behavior may serve as an important channel from leverage to consumer spending.

The remaining of this paper is organized as follows. Section II discusses related studies, while section III describes the macroeconomic environment behind the current study as its motivational economic background. Section IV describes the data with relevant descriptive features used in the current empirical study, while section V discusses the empirical specifications. Section VI estimates the empirical specifications in the two periods (2007-09 and 2011-13) and discusses the results. Section VII ends with a summary and a discussion of related policy issues.

¹See Romer (1990), who argues that high uncertainty depressed private consumption during the Great Depression in the US.

II. Relationship with Previous Studies

We can find theoretical arguments in literature that household indebtedness affects consumer spending. Mishkin (1976, 1977, 1978) suggested the illiquidity hypothesis, which holds that certain aspects of household balance sheets, such as liabilities, may influence households' levels of demand for illiquid assets such as durable goods and houses. For example, changes in the composition of household balance sheets in terms of liabilities (or financial asset holdings) would affect the demand for consumer durables even if net worth remains constant. If households' balance sheets deteriorate due to large household debt accumulation, consumer spending on illiquid items in particular would be severely depressed because more indebted households may fear financial distress in the future. King (1994) extends Fisher's (1933) original debt deflation theory and shows based on a theoretical model that household indebtedness can destabilize the real economy. According to King (1994), debtors' consumption functions may differ from those of creditors' such that their aggregation may result in a state of unstable macroeconomic equilibrium, in which aggregate consumption can be somewhat depressed. He argues that debt deflation theory may help us to understand the economic declines experienced by northern European countries in the 1990s. Eggertsson and Krugman (2012) also use debt-deflation theory to show based on a macroeconomic model with heterogeneity in household indebtedness taken into account that large deleveraging shocks can push the economy into much deeper recessions. Deleveraging shocks or a large decline in the desired level of leverage, due to uncertain income prospects for example, may induce debtors to reduce their consumption by a large amount, while savers (or creditors) may not increase their consumption enough to compensate for the consumption decline by debtors. Olney (1999) argues that the costs associated with defaults may result in large household spending cuts. Based on an empirical analysis of the relationship between defaults and consumer spending during the Great Depression, he concludes that the high costs of defaults forced households to make large spending cuts, especially in the face of uncertain income prospects. Hence, the difference in costs associated with consumer defaults may play an important role in consumer choice, especially in times of uncertain income prospects. Betti *et al.* (2007) link household over-indebtedness to too much consumption spending that is not sustainable in the long run. For example, over-indebted households will adjust their consumption expenditures when their expectation of future income is adjusted or shown to be false by actual outcomes. In this sense, too much debt accumulation based on incorrect beliefs about the future may result in adjustments in future consumption expenditures.

We may find empirical studies broadly related to the current study, which analyzes the relationship between household debt and the real economy in general. These previous studies conduct their analyses at various levels, from cross-country to household-level studies. Cross-country analyses of household debt and subsequent economic outcomes can be found in Bouis (2014), Jorda, Schularick, and Taylor (2013), Cecchetti *et al.* (2011), and Glick and Lansing (2010), among others. In addition to cross-country studies, there are cross-sectional analyses at the

state level or county level, as conducted by Mian, Rao, and Sufi (2013), Mian and Sufi (2010), and Gartner (2013), among others. We can also find Glick and Lansing (2009) and Olney (1999), who base their analyses on macro-level data in the US. These empirical studies indicate that the rapid accumulation of too much debt tends to be followed by an economic downturn of various depths and protracted recoveries; hence, household debt likely influences economic activity.

Close to the current study based on a household-level analysis but in a different empirical framework are Ogawa and Wan (2007) and Kim and Kim (2012). Ogawa and Wan (2007) study the debt-consumption relationship based on Japanese household data and argue that debt-asset ratios had negative effects on household consumption mainly through borrowing constraints when the bubble burst in the 1990s. Kim and Kim (2012) analyze the time frame of 2000-07 from the Korea Labor and Income Panel Study (KLIPS) and argue that household debt accumulation increased consumption by relaxing credit constraints during the sample period.

Studies fairly closely related to the present study with similar empirical frameworks were conducted by Dynan (2012), Andersen *et al.* (2014), and Son and Choi (2015). Dynan (2012) argues that the high leverage of households prior to the financial crisis may have weakened the recovery of consumption growth in the U.S. in the post-crisis years. Andersen *et al.* (2014) also study how the ex-ante level of household leverage may have affected the dramatic downturns in the Danish household sector in terms of the change in consumption expenditures in the post-crisis era. In line with these previous studies, Son and Choi (2015) analyze KLIPS data and argue that household leverage prior to the global financial crisis may be related to the downturns in consumption growth during the post-crisis years. In short, all of these studies analyze how the ex-ante leverage of households may be related to the ex-post recovery of consumption growth in the face of the deep recession during the global financial crisis of 2007-09. The current study complements earlier work by analyzing the impact of ex-ante household leverage on subsequent consumption behavior during the dramatic recession linked to the global financial crisis (2007-09) as well as the decelerating macroeconomic environment in recent years (2011-13). In addition, we shed light on other aspects of the debt-consumption relationship by analyzing different types of consumer spending and household characteristics. In terms of empirical specifications, we account for differences between debtors and non-debtors in terms of consumption behavior as well.

III. Background Economic Conditions

Household debt in Korea has increased relative to household income (or GDP) with only slight adjustments in 2007-08 and 2011-13 but without significant deleveraging processes, as shown in Figure 1, in contrast to countries that went through dramatic deleveraging phases amid the global financial crisis. The amount of household debt relative to income is high even compared to many other countries. The large accumulation of household debt relative to income suggests

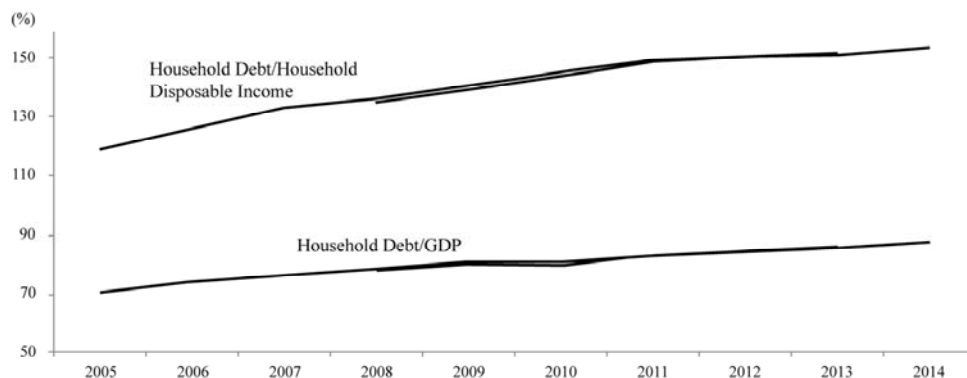


FIGURE 1. AGGREGATE HOUSEHOLD DEBT RELATIVE TO HOUSEHOLD INCOME AND GDP

Source: Flow of Funds (1993 SNA, 2008 SNA) and National Accounts from the Bank of Korea.

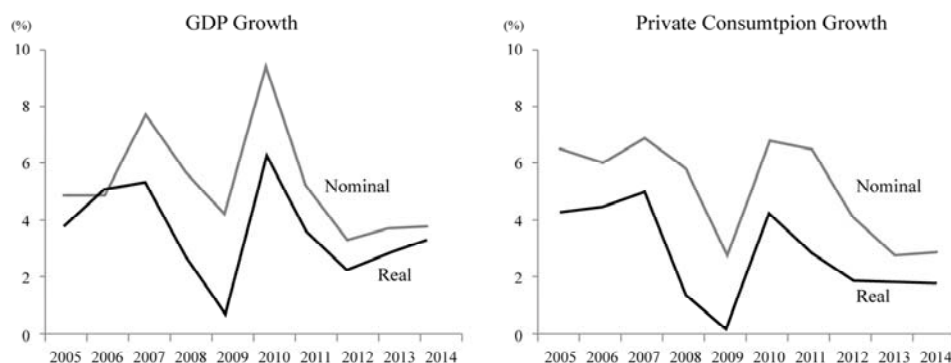


FIGURE 2. GDP AND PRIVATE CONSUMPTION GROWTH RATES

Source: National Accounts from the Bank of Korea.

that the balance sheet positions of the household sector have weakened.² Against this backdrop, household debt has often been cited as a contributing factor to the weak domestic demand after the global financial crisis, but without much evidence.

During the global financial crisis, the Korean economy experienced a deep recession. Figure 2 shows that the real GDP growth rate dropped from 5.3% in 2007 to 0.7% in 2009. Although the economy recorded a temporarily high GDP growth rate of 6.3% in 2010 immediately after the crisis, the real GDP growth rate dropped again to 2.3% in 2012, much lower than the average growth rate during the pre-crisis era. The weakening economic activity since 2010 as shown in Figure 2 may be partly due to the weak recovery of the global economy given the European fiscal and financial turmoil with the high levels of uncertainty.

We observe patterns in private consumption similar to that of GDP growth, as shown in Figure 2. Private consumption recorded a historically low real growth

²See Kim, Lee, Son, and Son (2014), Kim and Yoo (2013), and Kim and Byun (2012) among others for detailed descriptions and assessments of household debt in Korea.

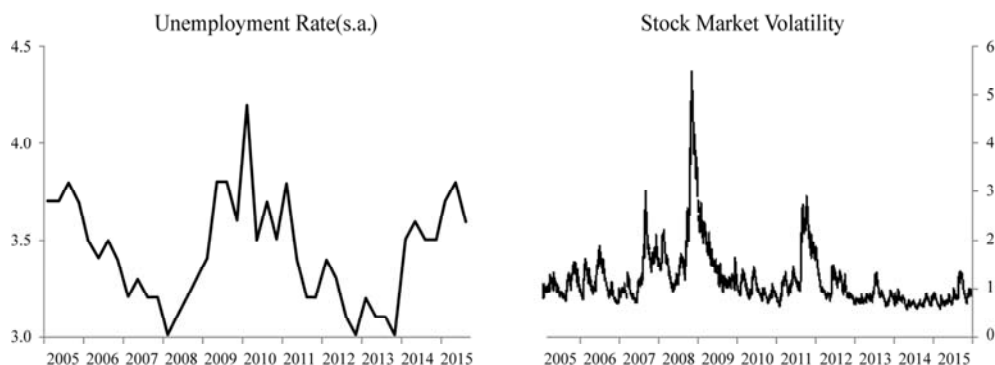


FIGURE 3. UNEMPLOYMENT (SEASONALLY ADJUSTED) AND STOCK MARKET VOLATILITY

Note: The stock market volatility is the GARCH (1,1) standard deviation of the daily returns from the KOSPI index.

Source: Statistics Korea, Korea Exchange.

rate of 0.2% in 2009, a large drop from the rate of 5% in 2007. After a temporary sharp rise up to 4.3% in 2010, the real consumption growth rate declined again to 1.9% in 2013 and has remained low in the subsequent years in comparison with the pre-crisis era. The weak consumption growth experienced by the household sector may also have put downward pressure on the overall economic activity. These macroeconomic conditions are the motivational background against which we attempt to analyze how the weak private consumption shown in Figure 2 may be related to the unprecedentedly high leverage of households.

Turning to the economic recession in 2008-09, the unemployment rate increased and remained relatively high for a while even after the financial crisis, as shown in Figure 3.³ As the economy came out of the recession, the unemployment rate gradually declined in 2011-13 to pre-crisis levels. As a measure of uncertainty, we can also observe stock market volatility.⁴ Stock market volatility jumped to very high levels at the onset of the financial crisis and then declined moving out of the recession. In the face of the European fiscal crisis (2011-12), stock volatility jumped again but to a lesser extent than that during the global financial crisis (2008-09). It is important to note the greater magnitude of the degree of uncertainty and the sizes of shocks, which were greater during the global financial crisis than during the subsequent period of European turmoil. High uncertainty and pessimistic views about the future amid the worsening macroeconomic development may have affected the perceptions of indebted householders of their desired debt levels; hence, some of them may have adjusted their spending downward in a precautionary manner, contributing to the weakness of private consumption growth, as shown in Figure 2. We expect that high uncertainty and more pessimistic views of the economy likely exerted more downward pressure on

³Hall (2012) pays particular attention to the level of unemployment as a major indicator of 'the slump.'

⁴Romer (1990) uses stock market variability as a measure of uncertainty to analyze its impact on the consumption contraction during the Great Depression in the US. We can also refer to Engle, Ghysels, and Sohn (2013); Hamilton and Lin (1996); and Schwert (1989), among others, who link stock market volatility to real economic activity.

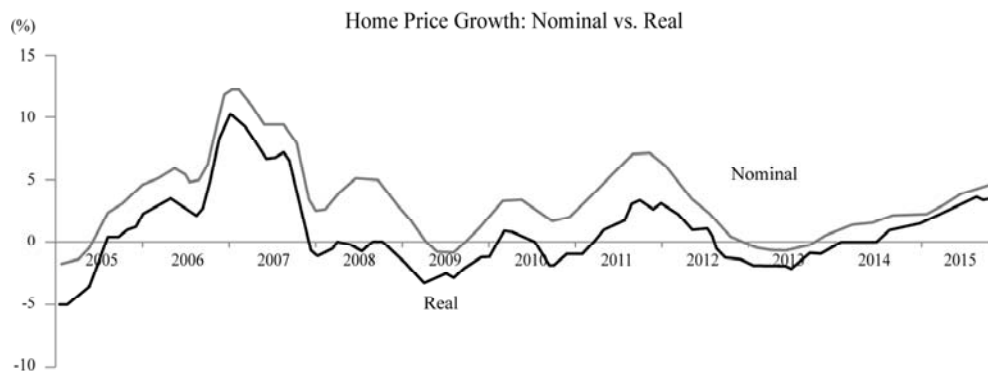


FIGURE 4. HOME PRICE GROWTH: NOMINAL VS. REAL RATES

Note: The grey line is the nominal annual% change and the black line is the real annual% change.

Source: Housing Purchase Price Index from KB Kookmin Bank.

consumer spending.

Amid the recession during the global financial crisis of 2007-09, the housing market also experienced depressive pressure, as shown in Figure 4. As macroeconomic conditions worsened again in 2011-13, though not as dramatically as in the financial crisis period, the housing market also faced downward pressure, as shown in Figure 4. The depressive developments in the housing market likely eroded the net worth of homeowners while damaging the balance sheet positions of highly leveraged homeowners in particular. We expect that those indebted and with weak balance sheet positions adjusted their spending behavior in the face of the downward pressure in the housing market, as they were likely to face difficulties in accessing credit or may have found that their current debt levels were not desirable. It should also be noted that there have been depressive developments in the housing market both in 2007-09 and 2011-13, through the downward pressure was greater and lasted longer during the global financial crisis era of 2007-09.

Along with the downward pressure in the housing market during the two periods (2007-09 and 2011-13), credit market conditions also turned unfavorable. A survey on lending practices suggested that households' accessibility to credit worsened during the crisis period and during 2011-13, as shown in Figure 5. The tightened credit standards may have influenced the consumption smoothing behavior of households during this time, especially for highly leveraged households or those in the low-income brackets with liquidity constraints. We may note that the regulatory LTV (loan to value) ceiling of bank loans had been set at 60%, until it was raised to 70% in August of 2014; hence, those high LTV borrowers may have had difficulty in accessing credit for additional loans. We expect that households' spending behavior may have been affected by credit standards but at different degrees depending on their leverage ratios.

We consider adverse macroeconomic conditions during the two periods of 2007-09 and 2011-13 in the analysis of the relationship between ex-ante household leverage and subsequent consumption growth. As discussed above, the former period is a recession characterized by high uncertainty and bleak future prospects with the housing market under downward pressure and credit market conditions

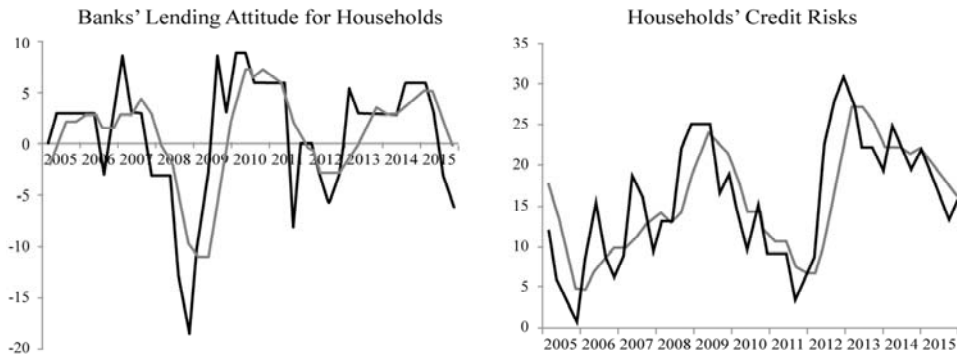


FIGURE 5. SURVEY ON LENDING PRACTICES: LENDING ATTITUDE AND CREDIT RISKS

Note: The grey lines are the four-quarter moving averages of each survey (in black lines).

Source: Survey on Lending Practices from the Bank of Korea.

tightened. The latter period also shows deceleration in economic activity overall but at less severe levels than in the former period. In short, the two periods (2007-09 and 2011-13) are characterized by worsening economic conditions while the former period involved a more adverse shock. We expect that household indebtedness likely influenced consumer spending in these times of adverse macroeconomic conditions. Against this background, we investigate how ex-ante household leverage may be related to subsequent consumer spending.

IV. Data and Descriptive Statistics

The current study uses the National Survey of Tax and Benefit (NaSTaB) as the household-level panel data set for the empirical analysis. The NaSTaB data set has been compiled and released annually since the first interview in 2008. This nationwide survey asks individuals and households about their economic activities and well-being mostly during the previous year in broad categories such as income, consumption, wealth, liabilities, taxes and benefits every year in an effort to understand the household sector. The data set involves 5,634 households which are surveyed yearly.⁵ The NaSTaB data used in the current empirical study contain rich information about consumption while covering the two periods of the recession of 2007-09 and the recent (2011-13) economic slow-down.

In order to analyze how households' financial positions are related to their consumption behaviors, we extract household-level information about their balance sheets and income-expenditure flows from the NaSTaB data set. Among the variables of interest, disposable income is calculated as the total sum of household income excluding non-consumption expenditures such as taxes and social security

⁵As an alternative data set with detailed information about the financial conditions of households, we may consider the Survey of Household Finances (SHF). However, the SHF does not contain much information about the consumption side of households, while it started in 2010, a few years after the global financial crisis.

TABLE 1—SUMMARY STATISTICS

(UNIT: 1,000KRW)

Year	2007	2009	2011	2013
Current Income	32,398	34,220	37,405	39,278
Non-current Income	2,223	2,824	2,128	1,190
Consumption expenditures	18,616	24,207	24,449	25,560
Non-consumption expenditures	5,652	6,149	6,811	7,997
Financial Asset	23,193	25,725	29,285	32,803
Real Estate Asset	184,816	183,740	202,201	217,022
Debt	34,198	34,649	39,382	40,396
Net Worth	176,291	176,575	193,483	209,909

Note: The numbers are average values in 1,000 KRW currency units. Among the variables, current income denotes regular sources of income covering labor income, asset income, net business income, social security income, transfer income, and other regular income. Non-current income is irregular or temporary sources of income such as inheritances and gifts. Adding all of the subcategories of current and non-current income gives the total household income. Non-consumption expenditures consist of income tax, property tax, pension payments, social security payments, transfer payments, and other similar payments.

Source: National Survey of Tax and Benefit, Korea Institute of Public Finance.

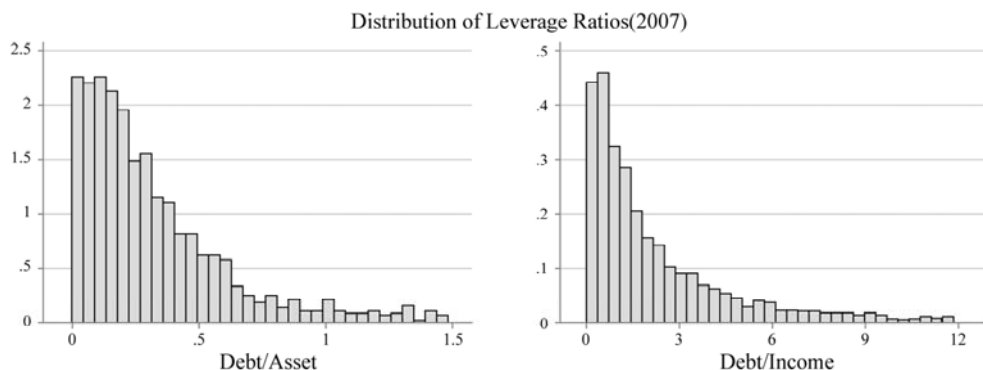


FIGURE 6. DISTRIBUTION OF DEBT-TO-ASSET AND DEBT-TO-INCOME RATIOS IN 2007

Note: The left and right panels show the distribution of the total debt to total asset ratios and the distribution of the total debt to disposable income ratios, respectively, for indebted households in 2007.

payments.⁶ Consumption expenditures, total assets, and the total debt of each household are calculated as the total sums of all of their respective sub-categories. Net worth is the difference between total assets and total debts. Table 1 shows the summary statistics of several major variables of interest. As a measure of the leverage ratio for each household, we consider total debt (D)/total assets (A), net worth (NW)/total assets (A), and the total debt/disposable income ratio. We may note that the D/A and NW/A ratios contain essentially the same information as a measure of the balance sheet composition because $NW/A = (A - D)/A = 1 - D/A$.

The current study investigates how households' balance sheet positions affect the behaviors of the households as consumers. In particular, we pay attention to the heterogeneity of household leverage as a possible determinant that affects consumption decisions. Below we show how households differ in terms of their

⁶See the notes below Table 1 for detailed information about the income categories of the NaSTaB data set.

leverage ratios. We consider the total debt/total assets and total debt/disposable income ratios as measures of household leverage. Figure 6 shows the distribution of the debt-to-asset and debt-to-disposable income ratios for indebted households in 2007. In the figure, we find much heterogeneity in leverage ratios across indebted households. We also note that households are heterogeneous in terms of their net asset ratios because the net asset ratios contain essentially the same information about the balance sheet composition as the debt-to-asset ratios. In other words, the net worth buffers, working as cushions against potential financial distress, are different across households. Thus, the heterogeneity in leverage ratios may indicate different degrees of resilience across households against an adverse economic environment. We examine how the ex-ante heterogeneity in households' leverage ratios is related to the subsequent consumption behavior of the household in the face of adverse economic conditions.

V. Empirical Specifications

In this section, we establish empirical specifications to analyze how household leverage may affect consumption behavior in the face of adverse economic environments. We are interested in the two periods of 2007-09 and 2011-13, during which macroeconomic conditions worsened but in different degrees, as discussed above. In the current study, we ask if households' indebtedness contributed to the weakness in their consumption expenditures during the deep recession of the global financial crisis of 2007-09 and during the decelerating macroeconomic conditions of 2011-13. From the perspective of business cycle research, this question asks whether households' indebtedness or balance sheet positions can amplify the depth and/or duration of the downward pressure on aggregate economic activity. We often encounter such claims from news media and from policy circles, who state that unprecedentedly large amounts of debt can be blamed for the continuing weakness in private consumption since the global financial crisis, but without much empirical evidence. The current study aims to address this issue by providing evidence based on household data analysis.

In order to address this issue, we set out a baseline regression specification which may explain how consumption growth is determined with household debt taken into account. Reflecting on previous arguments pertaining to wealth as a determinant of consumption, we take net worth as a major determinant of consumption in addition to income.⁷ In addition to the net worth component of the balance sheet, we ask how a balance sheet composition in terms of the leverage ratio can affect consumer spending. It is important to note that the net worth component itself does not tell us much about the composition or vulnerability of the balance sheet. In contrast, such leverage ratios as the debt-to-asset ratio ($=D/A$) or the net-worth-to-asset ratio ($=NW/A$) may measure the composition of the

⁷As possible channels from wealth to consumption, such arguments as wealth effects, collateral constraints, common factors, and financial liberalization are discussed in the literature, although some of these arguments remain under debate (Browning, Gørtz, and Leth-Petersen 2013). See also Disney, Gathergood, and Henley (2010); Campbell and Cocco (2007); and Iacoviello (2004), among others, for more discussions on the effects of wealth on consumption.

household balance sheet because the size of the balance sheet (asset; A) equals debt (D) plus the net worth (NW). To explain how vulnerability in the balance sheet composition may affect consumer spending, we incorporate the heterogeneity in household leverage ratios into the empirical specification as a potential factor that affects consumption behavior. In addition, we consider that debtors (borrowers) may show different consumption behaviors from non-debtors (savers) mainly due to their different preferences, as discussed by Eggertsson and Krugman (2012) and by King (1994), among others.

Reflecting on the above discussions, we examine the following empirical specification as a baseline regression model in order to answer the questions at hand.

The baseline regression specification is as follows:

$$(1) \quad \Delta C_{i,t_0-t_1} = \beta_0 + (\beta_1 + \beta_2 * Lev_{i,t_0}) * D_dum_{i,t_0} + \beta_3 \Delta Y_{i,t_0-t_1} + \beta_4 \Delta NW_{i,t_0-t_1} \\ + \beta_5 \Delta HHSize_{i,t_0-t_1} + \beta_6 X_{i,t_0} + \varepsilon_i$$

Here, $\Delta C_{i,t_0-t_1}$ is the change in the consumption expenditures of household i in the period from t_0 to t_1 . Lev_{i,t_0} is the leverage ratio of household i at t_0 , the beginning of the period in which macroeconomic conditions worsened. D_dum_{i,t_0} is a dummy variable that represents the indebtedness of household i at t_0 ; hence, $(\beta_1 + \beta_2 * Lev_{i,t_0})$ can be interpreted as the difference in consumption growth rates between debtors and non-debtors while $\beta_2 * Lev_{i,t_0}$ can explain the difference between debtors with different leverage ratios. As a measure of Lev_{i,t_0} , we consider the debt/asset (D/A) or debt/income (D/Y) ratios. Note that the debt/asset ratio contains information identical to that associated with the net worth buffer (=net worth/asset), as discussed earlier. In the specification, $\Delta Y_{i,t_0-t_1}$, $\Delta NW_{i,t_0-t_1}$, and $\Delta HHSize_{i,t_0-t_1}$ denote the change in disposable income, the net worth, and the family size of household i in the period from t_0 to t_1 , respectively. $\Delta Y_{i,t_0-t_1}$ may be relevant to liquidity-constrained or myopic households whose consumption levels may be affected by their income changes. The household size $(\Delta HHSize_{i,t_0-t_1})$ can explain the hump-shaped pattern of the lifetime consumption profile.⁸ X_{i,t_0} is a vector of other variables at t_0 that may influence subsequent consumption changes, such as household characteristics that may reflect consumer preferences - e.g. X_{i,t_0} may include educational attainment levels and demographic structures. For example, older householders in retirement may be more sensitive regarding their consumption in response to poor economic

⁸See Attanasio *et al.* (1999) and Attanasio and Weber (1995), among others, about the relationships between changes in family compositions and consumption growth.

conditions with uncertainty and tight credit standards. (t_0 and t_1) represent (2007, 2009) for the recession of the global financial crisis and (2011, 2013) for the recent economic slow-down, respectively. We also examine alternative specifications as variants of the baseline model (1) to address the relevant issues at hand.

Note that C, Y, and NW in the above specification are ‘inverse hyperbolic sine’ transformed,⁹ respectively, as suggested by Dynan (2012). This type of transformation can incorporate such cases with zero or negative (-) variables while dealing with extreme values in micro-data sets. For example, there may be many households with a negative (-) ‘net worth’; hence, taking the logs of such variables may reduce the sample size while excluding the relevant households from the regression analysis. As noted by Dynan (2012), the interpretation of this type of transformation may be similar to that of a logarithmic transformation except for the very small values. For the use of and discussion about this transformation, see Carroll, Dynan, and Krane (2003); Dynan (2012); Browning *et al.* (2013); and Burbidge *et al.* (1988), among others.

We consider differences in consumption types, income and net worth levels in the following analyses of consumer behavior in relation to leverage. Taking the differences in those categories into account may shed some light on the possible channels from household leverage to consumption behaviors while providing useful guidance for policy directions. For example, household expenditures can be divided into those for durable goods and non-durables because the demand for durables may be more sensitive to uncertainty and credit standards than that for non-durables. Hence, the responses pertaining to durables may be more dramatic in times of more adverse economic downturns. In addition, we divide households into low- and high-income (wealth) groups because low-income (wealth) families are likely to be liquidity-constrained, whereas high-income (wealth) families tend to be less liquidity-constrained with high saving rates. We compare low-income (wealth) households with high-income (wealth) groups to shed light on the role of uncertainty in comparison with credit standards.

VI. Estimation Results and Discussions

We examine below how households may have responded in terms of their consumption expenditure in relation to their leverage ratios during the global financial crisis (2007-09) as well as in the recent years of the decelerating macroeconomic conditions (2011-13). As measures of the leverage ratio, we consider the ratio of total debt to total assets (D/A) and total debt to disposable income (D/Y). The baseline specification (1) and its variant forms are estimated for each period as discussed above and the main results are reported in Table 2 ~ Table 4. For the estimations, outliers in the leverage ratios are excluded from the sample.

Table 2 shows the baseline regression results for each respective period: 2007-09 vs. 2011-13. We find that indebtedness shows significant and negative effects on consumption expenditure growth, suggesting that the liability side of balance sheet

⁹‘Inverse hyperbolic sign’ transformation of $x = \log(x + (x^2 + 1)^{1/2})$

TABLE 2—BASELINE REGRESSIONS EXPLAINING CONSUMPTION GROWTH

	Δ Consumption in 2007-09					Δ Consumption in 2011-13				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
D_dum ^a	-0.100** (0.025)			-0.073** (-0.029)	-0.072** (-0.028)	-0.138** (-0.024)			-0.098** -0.028	-0.080** -0.027
D/A ^a		-0.114** (0.032)					-0.180** (-0.034)			
D/Y ^a			-0.016** (0.004)					-0.029** (0.004)		
(D/A)*D_dum ^a				-0.070** (0.036)					-0.116** (0.038)	
(D/Y)*D_dum ^a					-0.011** (0.005)					-0.022** (0.005)
Δ Income	0.136** (0.016)	0.135** (0.016)	0.141** (0.016)	0.135** (0.016)	0.139** (0.016)	0.207** (0.016)	0.206** (0.016)	0.223** (0.016)	0.206** (0.016)	0.219** (0.016)
Δ Net Worth	0.007** (0.003)	0.011** (0.003)	0.007** (0.003)	0.010** (0.003)	0.007** (0.003)	0.008** (0.004)	0.014** (0.004)	0.008** (0.004)	0.012** (0.004)	0.008** (0.004)
Δ Family Size	0.161** (0.022)	0.161** (0.022)	0.162** (0.022)	0.160** (0.022)	0.161** (0.022)	0.175** (0.019)	0.176** (0.019)	0.177** (0.019)	0.174** (0.019)	0.175** (0.019)
(40s_50s)_dum ^a	0.01 (0.032)	0.001 (0.032)	0.012 (0.032)	0.007 (0.032)	0.014 (0.032)	-0.003 (0.033)	-0.019 (0.033)	-0.001 (0.033)	-0.009 (0.033)	0.003 (0.033)
(After_60)_dum ^a	-0.103** (0.041)	-0.108** (0.041)	-0.085** (0.041)	-0.109** (0.041)	-0.095** (0.041)	-0.021 (0.041)	-0.034 (0.041)	0.007 (0.041)	-0.032 (0.041)	-0.003 (0.041)
Education ^a	-0.011 (0.009)	-0.015* (0.009)	-0.011 (0.009)	-0.012 (0.009)	-0.01 (0.009)	-0.015* (0.009)	-0.021** (0.009)	-0.016* (0.009)	-0.017* (0.009)	-0.014 (0.009)
Const.	0.272** (0.054)	0.271** (0.054)	0.240** (0.053)	0.283** (0.054)	0.264** (0.054)	0.127** (0.056)	0.128** (0.056)	0.088 (0.055)	0.140** (0.056)	0.109* (0.056)
Adj. R ²	0.044	0.043	0.043	0.044	0.045	0.077	0.076	0.079	0.079	0.081
# Obs.	3,791	3,791	3,791	3,791	3,791	4,236	4,236	4,236	4,236	4,236

Note: * p<0.1, ** p<0.05. ^a indicates the beginning of each period: 2007 for the sample period of 2007-09 and 2011 for the sample period of 2011-13. Δ Income, Δ Net Worth, Δ Family and Size are changes in income, net worth, and family size, respectively. D_dum is a dummy variable for debt holdings. D/A and D/Y are the debt-to-asset and debt-to-income ratios, respectively. (40s_50s)_dum and (After_60)_dum are dummy variables denoting a householder aged 40-60 and after 60, respectively.

vulnerability affects their consumption behavior. It should be noted that the impact of household indebtedness on consumption growth is stronger in 2011-13 ((1)~(5)) than in 2007-09 ((6)~(10)). That is, debtors adjusted their consumption growth down more conspicuously during the less adverse macroeconomic environment (2011-13) than during the recession (2007-09). This result suggests the possibility that household balance sheets were more vulnerable in the interim period (2007-11) such that borrowers showed more sensitive responses even against the less adverse economic conditions in the latter period.¹⁰ We find that all of the changes in disposable income, net worth, and family size have positive signs with high significance levels, as expected, consistent with the findings of previous studies. We also note that households with older householders above 60 years of age show lower levels of consumption growth compared to those in other age groups for 2007-09, suggesting that older household heads behaved in a more precautionary manner under the mounting uncertainty associated with the global financial crisis of 2007-09.¹¹ It is interesting to note that household heads with higher educational

¹⁰Household debt increased by almost 40% from 2007 to 2011, largely led by loans from non-bank financial institutions. See Kim and Yoo (2013) and Kim and Byun (2012), among others, for detailed information about how household debt and its quality levels changed during the period.

¹¹The regression for the robustness check shows that consumption growth for older householders during

attainment have shown lower consumption growth in the face of the adverse economic conditions in both 2007-09 and 2011-13 periods.

It is important to note that both the debt dummy (β_1) and the cross-product term between the debt dummy and the debt-to-asset ratio (β_2) are highly significant ((4), (5), (9), and (10)) such that omitting either of them can lead to biased estimates. In order to gain a sense of the size of the impact of indebtedness on consumption growth during 2007-09, we can examine the estimates of the debt dummy (-0.073) and the cross-product term between the debt dummy and the debt-to-asset ratio (-0.07) in (4). If we considered a debtor with a 10% debt-to-asset ratio and a non-debtor, the difference in their nominal consumption growth rates with all else being equal would be -8%p/2yrs. ($= -0.073 - 0.07 \times 0.1$), or -4%p/yr. On the other hand, if we considered the case between debtors with a 10%p difference in the debt-to-asset ratio, the difference in their nominal consumption growth rates would be -0.7%p/2yrs. ($= -0.07 \times 0.1$), or -0.35%p/yr. Following the same procedures above and based on estimation results in (9) for the period of 2011-13, we note that the difference in the nominal consumption growth rates between the debtor with a 10% debt-to-asset ratio and the non-debtor would be -10.96%p/2yrs. ($= -0.098 - 0.116 \times 0.1$), or -5.48%p/yr. On the other hand, the difference in nominal consumption growth rates between debtors with a 10%p difference in the debt-to-asset ratio would be -1.16%p/2yrs. ($= -0.116 \times 0.1$), or -0.58%p/yr. in 2011-13. Hence, there appears to be a relatively large difference between debtors and non-debtors in terms of their consumption behavior in the face of adverse economic conditions in comparison with the difference between debtors with different leverage ratios.

We find from the above analyses that higher leverage ratios may exert greater downward pressure on the growth rates of consumption expenditures. Figure 7 shows the heterogeneity in the household leverage ratios in terms of the debt-to-

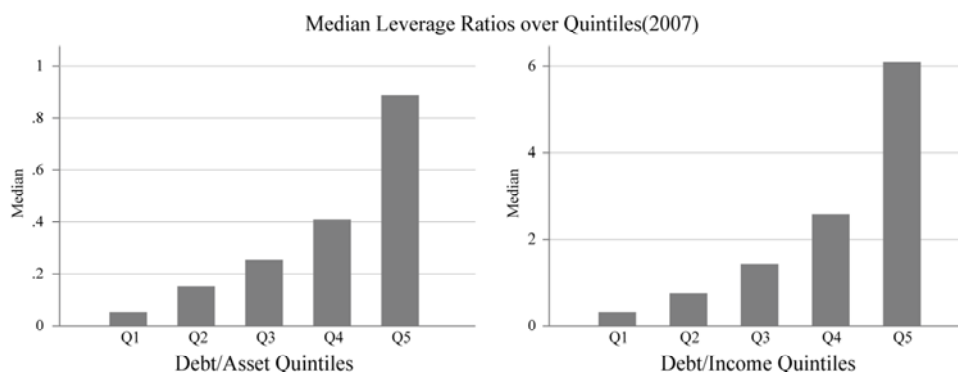


FIGURE 7. LEVERAGE RATIOS OF INDEBTED HOUSEHOLDS:
DEBT/ASSET AND DEBT/INCOME RATIOS

Note: The leverage ratios are divided into five quintiles from the bottom 20% to the top 20% (Q1, Q2, Q3, Q4, and Q5).

2011-13 would also be lower than that of other age groups if the possible previous consumption spikes were controlled for by including the lagged consumption growth in the regression specification.

TABLE 3—REGRESSIONS EXPLAINING CONSUMPTION GROWTH: DURABLES VS. NON-DURABLES

	Δ Consumption in 2007-09				Δ Consumption in 2011-13			
	(Durables)		(Non-durables)		(Durables)		(Non-durables)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D_dum ^a	-0.505** (0.121)	-0.452** (0.121)	0.041** (0.015)	0.029* (0.015)	-0.213** (0.072)	-0.201** (0.072)	-0.023* (0.014)	-0.031** (0.014)
(D/A)*D_dum ^a	-0.198 (0.151)		-0.031 (0.019)		-0.232** (0.100)		-0.038** (0.019)	
(D/Y)*D_dum ^a		-0.050** (0.021)		-0.000 (0.003)		-0.035** (0.013)		-0.002 (0.002)
Δ Income	0.139** (0.066)	0.156** (0.066)	0.075** (0.008)	0.076** (0.009)	0.257** (0.043)	0.277** (0.043)	0.094** (0.008)	0.096** (0.008)
Δ Net Worth	0.028** (0.013)	0.022* (0.012)	0.005** (0.002)	0.003** (0.002)	0.017* (0.010)	0.009 (0.009)	0.006** (0.002)	0.005** (0.002)
Δ Family Size	0.229** (0.091)	0.232** (0.091)	0.185** (0.012)	0.185** (0.012)	0.305** (0.050)	0.307** (0.050)	0.194** (0.010)	0.194** (0.010)
(40s_50s)_dum ^a	0.387** (0.133)	0.415** (0.133)	-0.046** (0.017)	-0.044** (0.017)	0.154* (0.088)	0.175** (0.088)	-0.020 (0.017)	-0.017 (0.017)
(After_60)_dum ^a	0.315* (0.172)	0.371** (0.172)	-0.103** (0.022)	-0.101** (0.022)	-0.137 (0.107)	-0.085 (0.107)	0.015 (0.020)	0.02 (0.020)
Education ^a	0.021 (0.038)	0.029 (0.038)	-0.011** (0.005)	-0.010** (0.005)	-0.034 (0.024)	-0.029 (0.024)	-0.013** (0.005)	-0.013** (0.005)
Const.	3.236** (0.227)	3.167** (0.226)	0.190** (0.029)	0.185** (0.029)	0.304** (0.147)	0.250* (0.146)	0.063** (0.028)	0.057** (0.028)
Adj. R^2	0.012	0.013	0.101	0.100	0.029	0.029	0.148	0.147
# Obs.	3,791	3,791	3,791	3,791	4,236	4,236	4,236	4,236

Note: * $p < 0.1$, ** $p < 0.05$. ^a indicates the beginning of each period: 2007 for the sample period of 2007-09 and 2011 for the sample period of 2011-13. Δ Income, Δ Net Worth, Δ Family and Size are changes in income, net worth, and family size, respectively. D_dum is a dummy variable for debt holdings. D/A and D/Y are debt-to-asset and debt-to-income ratios, respectively. (40s_50s)_dum and (After_60)_dum are dummy variables denoting a householder aged 40-60 and after 60 respectively.

asset ratio and the debt-to-income ratio. In particular, we find that debtors in the top quintile take very high leverage positions compared to those by other groups. This distributional feature suggests that the impact of the leverage ratio on household spending is heterogeneous, with its impacts more concentrated in highly leveraged households. We can compute the difference in the depressive effects of leverage ratios on consumption growth across different groups of leverage ratios. For example, the difference in the median debt/asset ratio between the fourth and the fifth quintile is approximately 0.48 for 2007, explaining approximately -3.36%p/2yrs. ($= -0.07 \times 0.48$), or a -1.68%p/yr. difference between the two groups for nominal consumption growth during 2007-09. The difference in the median debt/asset ratio between the third and fourth quintile is close to 0.16 for 2007, explaining about -1.12%p/2yrs. ($= -0.07 \times 0.16$), or a -0.56%p/yr. difference between the two groups in terms of nominal consumption growth for 2007-09. Thus, we note how the distributional feature of leverage ratios in the household sector would predict the distribution of consumption growth with all else being equal.

Table 3 shows the regression results for consumer durables and non-durables in the two periods of 2007-09 and 2011-13. Household expenditures can be divided into durable goods and non-durables. The demand for consumer durables may be more sensitive to uncertainty and credit standards than that for non-durables; hence, the responses for durables may be more dramatic in times of more severe economic downturns. We find that indebted households cut back their demand for durables much more strongly than their demand for non-durables in the face of the

TABLE 4—REGRESSIONS EXPLAINING CONSUMPTION GROWTH:
FOR INDEBTED HOUSEHOLDS WITH DIFFERENT INCOME AND NET WORTH LEVELS

	Δ Consumption in 2007-09				Δ Consumption in 2011-13			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(D/A) ^a	-0.169** (0.057)	-0.139** (0.044)			-0.179** (0.071)	-0.189** (0.046)		
(D/A)*(50<Y<80)_dum ^a		0.036 (0.079)			-0.062 (0.089)			
(D/A)*(Y>80)_dum ^a		-0.013 (0.095)			0.010 (0.104)			
(D/A)*(50<NW<80)_dum ^a		-0.612** (0.152)				-0.607** (0.147)		
(D/A)*(NW>80)_dum ^a		-1.111** (0.243)				-1.095** (0.218)		
(D/Y) ^a			-0.017* (0.009)	-0.017** (0.007)			-0.032** (0.008)	-0.020** (0.006)
(D/Y)*(50<Y<80)_dum ^a			-0.004 (0.012)				-0.004 (0.012)	
(D/Y)*(Y>80)_dum ^a			-0.015 (0.013)				0.001 (0.011)	
(D/Y)*(50<NW<80)_dum ^a				-0.012 (0.012)				-0.059** (0.012)
(D/Y)*(NW>80)_dum ^a				-0.038** (0.017)				-0.045** (0.018)
Adj. R ²	0.040	0.056	0.042	0.044	0.064	0.081	0.071	0.082
# Obs.	1,868	1,868	1,868	1,868	1,894	1,894	1,894	1,894

Note: * p<0.1, ** p<0.05, ^a indicates the beginning of each period: 2007 for the sample period of 2007-09 and 2011 for the sample period of 2011-13. All explanatory variables are not reported to save space. D/A and D/Y are debt-to-asset and debt-to-income ratios, respectively. (50<Y<80)_dum and (Y>80)_dum are dummy variables for households' disposable income levels between 50-80% and above 80%, respectively. (50<NW<80)_dum and (NW>80)_dum are dummy variables for households' net worth levels between 50-80% and above 80%, respectively.

adverse economic environments, thus confirming the argument of Mishkin (1976) based on household-level analysis. In 2007-09, indebted households' levels of demand for durables showed much lower growth rates than that for non-debtors ((1) and (2)), while their expenditures for non-durables recorded somewhat higher growth rates than those of non-debtors ((3) and (4)). In 2011-13, debtors adjusted their expenditure growth down for both durables and non-durables, while their downward adjustments were much stronger for durables ((5) and (6)) than for non-durables ((7) and (8)). The decline in consumption growth for non-durables in particular may reflect the fact that debtors' perceptions of economic prospects may have been worse. Regarding the nominal growth in non-durable consumption in 2011-13, the difference between a debtor with a 10% debt/asset ratio and non-debtors would be -2.68%p/2yrs. ($= -0.023 - 0.038 \times 0.1$), or -1.34%p/yr., while the difference between debtors with a 10%p difference in the debt/asset ratio would be -0.38%p/2yrs, or -0.19%p/yr.

Table 4 shows the regression results for indebted households with different income and net worth levels. Household income is divided into three groups: below the median (<50%), 50-80%, and above 80%. Household net worth levels are also divided into three groups: below the median (<50%), 50-80%, and above 80%. Families with low income (wealth) levels are likely to be liquidity-constrained, whereas families with high income (wealth) levels tend to be not or less liquidity-constrained with high saving rates. We compare low-income (wealth) indebted

households with high-income (wealth) groups to shed light on the roles of uncertainty and credit standards. The estimation results show that household leverages in all income (wealth) brackets exert significant downward pressure on consumption growth in both periods, while the effects are stronger in the high-income (wealth) groups. This result suggests that uncertainty or pessimistic views of the future may have caused leveraged households to adjust their consumption growth down in a more precautionary manner. The depressive effects of the leverage ratios on consumption growth are weaker in the low-income (wealth) brackets because they may have already spent a large share of their income for consumption to maintain their minimal living standards, while those in the top income (wealth) brackets still had room to reduce their spending. Given that leverage ratios tend to be higher in low-income households, the adverse events for low-income debtors may have had somewhat sizable effects on their spending growth despite the fact that the depressive effects of leverage on consumption growth are less severe for low-income groups than for high-income groups. It should also be noted that the depressive effects of leverage on consumption growth were greater in 2011-2013 ((5)~(8)) than in 2009-11 ((1)~(4)) in all income (wealth) brackets. This result suggests that household leverage may have raised more concern about the real economy in more recent years.

We also performed robustness-check regressions in the current study, though the estimation results are not reported here due to space constraints. We assessed how certain possible consumption spikes in previous years would affect the main results in the above analyses, finding that the regressions for the robustness check increase R^2 significantly, while most of the main results of this paper remain effective.¹² In addition, we checked how debt accumulation for a temporarily large expenditure in the previous period would affect the estimated relationship between ex-ante leverage and ex-post consumption growth, finding that the regressions excluding those (potentially bias-generating) households from the sample still support the main results of the current study.¹³

VII. Concluding Remarks

The findings of the current study show that the soundness of household balance sheets matter in the real economy even in cases in which financial markets and intermediaries continue to function without severe disruptions. In other words, liability-side vulnerability or the weak financial positions of households may put

¹²For the robustness check, we controlled several possible spikes in consumption, such as auto purchases at the beginning year (t_0) by including the lagged consumption growth in the regression specifications, as discussed by Andersen *et al.* (2014) and Son and Choi (2015). Among previous studies, Andersen *et al.* (2014) and Son and Choi (2015) considered the effects of such possible consumption spikes on the subsequent consumption growth, whereas Dynan (2012) did not take such effects into account in her analyses.

¹³Households that increased their debt for temporarily large expenditures (such as medical expenditures or auto purchases) in the previous period may contribute to some bias to the estimated relationship between ex-ante leverage and ex-post consumption growth. In order to deal with this issue, we undertook robustness-check regressions while excluding from the sample the (potentially bias-generating) households that spent more than their available income and increased their debt during the previous period. We find that the main arguments of the current study remain effective even after controlling for this type of potential bias.

downward pressure on private consumption even when the economy does not undergo a dramatically deep downturn. It should be noted that the depressive effects of households' obligations on consumer spending may be heterogeneous, while they are more concentrated for highly leveraged groups than they are for others. That is, consumption expenditures of highly leveraged households may be more vulnerable to shocks than those of low-leveraged households or non-debtors. We find that adjustments in consumer spending by debtors were stronger for durable goods than for non-durables. In addition, we find that debtors in high-income (wealth) groups showed even stronger adjustments in their consumption expenditures than did low-income (wealth) groups. These findings suggest that leveraged households may have behaved in a more precautionary manner in the face of uncertainty or pessimistic economic prospects, hence contributing to weak consumption growth. The above findings suggest that keeping household balance sheets sound may be important for the resilience of the real economy.

In the following paragraphs, we discuss several policy issues with respect to the depressive effects of liability-side household vulnerability on consumption. In order to keep the economy resilient, the weakening demand from leveraged households should be offset by rising levels of demand from other sectors of the economy. However, friction existing in many areas of the economy may prevent the reallocation of resources from one sector to another, aggravating the downward pressure on aggregate demand levels and on the overall economic activity, as indicated by Eggertsson and Krugman (2012), Hall (2011) and by Midrigan and Philippon (2011), among others. Thus, there may be room for policies to cushion the weakness on the demand side by relieving households' debt burdens or by creating some demand.

Policies to improve balance sheets may contribute to the recovery of the household sector, as balance sheet deterioration due to excessive debt accumulation may depress consumer spending. In the face of a debt-driven slow-down, monetary policies which raise inflation expectations may contribute to reducing real debt burdens (Svensson 2012). However, the central bank's credibility may be a factor affecting inflation expectations; it can be argued that central banks may have difficulty in raising inflation expectations owing to their apparent commitment to prevent it (Eggertsson and Krugman 2012). Hence, it is often argued that fiscal policies may play a more effective role in getting the economy out of a debt-driven slow-down if vulnerable balance sheets can be repaired in a relatively short period of time without damaging fiscal consolidation (Eggertsson and Krugman 2012). However, it should be noted that there still appears to be unsettled debate regarding the effectiveness of fiscal policies.

Monetary and financial policies in the past and in the present can affect the cost and availability of credit such that households may be incentivized to accumulate large amounts of household debt. If household balance sheets deteriorate, they would depress future consumer expenditures, such as those on durable goods, and house purchases in particular, because leveraged households may fear or are more likely to experience financial distress, as argued by Mishkin (1976, 1977, 1978). In this respect, there may be an emerging role for macro-prudential policies that attempt to prevent rapid credit expansions or too much leverage in order to keep households' balance sheets sound, for example.

From an institutional perspective over a much longer time horizon, we can examine institutional arrangements that may affect the cost and availability of credit, as misaligned incentives may weaken the financial positions of households as well as financial institutions. In other words, current institutional arrangements may need to be under scrutiny regarding their appropriateness in relation to their overall economic performance. For example, the cost of defaults may be strongly associated with households' consumption behaviors, especially in times of rising uncertainty followed by pessimistic views of the future economy, as argued by Olney (1999).

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