Household Coping Strategies and the Financial Crisis in Korea*

by

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Abstract

In order to examine how Korean households coped with the financial crisis, this paper employs household-level panel data during 1995-98 and estimates a switching regression model of an augmented consumption Euler equation with endogenous credit constraints. Several empirical findings emerge. First, the estimated result confirms our hypothesis that the main reason why Euler equation is found to be not holding is the credit constraints. Second, households coped with the negative shocks by reducing consumption of luxury items, while maintaining food, education, and health related expenditure. Third, for credit-constrained households, private transfers appeared to act as an ex post coping strategy during the crisis. Finally, we find public transfers to be an effective coping device for those who are credit-constrained before and during the crisis.

Keywords: Financial crisis; Credit constraints; Risk-coping strategies; Switching regression

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1. Introduction

The Asian financial crisis in 1997 caused a serious deterioration of household welfare in Korea. The poverty head count ratio in urban Korea jumped from 7.5% in the first quarter of 1997 to 23 % in the third quarter of 1998 (World Bank 2000; Kakwani 2000). This is partly due to the increase in unemployment–unemployment rate increased from 2.6 percent in 1997 to 8.7 in 1998. Also, real GDP and real wage fell by ten and nine percent, respectively, in one year.

However, as indicated by the World Bank (2000), in retrospect, the negative impact of the crisis on household welfare in Korea was smaller than was originally expected.[1] The sensible responses of households played an important role in coping with the macroeconomic shocks caused by the crisis. Households reduced expenditure of nonessential luxury items to protect the minimum standard of living. In addition, the World Bank (2000) also concluded that dissavings, sales of assets, and private transfers were also important coping strategies. The government played a key role as well. Among the crisis-hit countries, Korea was the most successful in providing public safety nets in the form of unemployment insurances and workfare programs.[2]

Yet, there is an important heterogeneity among households. Some households with effective risk-coping means were insulated from the macroeconomic shocks, while others with no risk-coping means were seriously affected by the economic downturn. It is entirely an empirical question for whom, which and how risk-coping devices worked against the negative shocks caused by the crisis. This study is first in addressing this question, investigating the relative effectiveness of different formal and informal risk-coping devices. It also tries to infer how credit constraint affects the effectiveness of risk-coping devices by using household-level

[1] For example, Cheong (2001) found that Gini coefficient for urban households in terms of per capita consumption did not increase, while it increased sharply in terms of per capita income during the crisis, implying that household consumption was relatively insulated from income shortfalls.

[2] A new workfare program was introduced in May 1998 that had provided 437,000 jobs by January 1999. The coverage of an official unemployment insurance program was also expanded in October 1998 from firms with more than 30 employees to all firms as well as to temporary and daily workers.

panel data during 1995-98 and estimating a switching regression model of an augmented consumption Euler equation with endogenous credit constraints.

Recent studies on the Life Cycle and Permanent Income Hypothesis (LC-PIH) such as Campbell and Mankiw (1989), Zelds (1989), Antzoulatos (1994), Garcia, Lusardi, and Ng (1997), Jappelli, Pischke and Souleles (1998) indicate that credit constraint is the reason why the hypothesis is rejected for some cases. Extending this issue, we investigate "how" the hypothesis is rejected by explicitly considering the endogeneity of credit constraints together with the effectiveness of various risk-coping strategies. We believe that an augmented Euler equation approach taken in this paper contributes to the empirical literature on the hypothesis.

We also believe that the investigation of the relative effectiveness of risk-coping devices is indispensable in making a proper assessment of social safety nets since changes in the costs and benefits of one coping strategy will affect how other strategies are used. It would be misleading to consider a single risk-coping strategy in isolation from other strategies (Alderman and Paxson 1992, p.2). In particular, the government, in its attempt to provide public support during a crisis, may cause social costs that reduce or offset the effectiveness of its program if it fails to consider other risk-coping devices employed by its target group. It is therefore important to examine whether a government program crowds out existing private insurance mechanisms and whether its coverage of public eligibility is limited only to those unprotected. In this context, we believe our integrated analysis of risk coping devices has important policy implications in the preparation of well-designed social safety nets against a future currency and/or financial crisis.

This paper is organized as follows. Section 2 reviews various coping strategies. Section 3 provides the theoretical framework of the paper that is the basis of the econometric framework derived in Section 4. Section 5 discusses the data and empirical results and the last section concludes.

2. Various Risk-coping Strategies

People in low- and middle-income countries, especially the poor, are confronted by ex post shocks in their day-to-day lives. For example, crops and livestock, which are the sources of income of most of these people, may be destroyed by natural hazards such as hurricanes, floods, fire, and serious drought. There are also serious risks in business contracts where the legal system is underdeveloped. Accidents, sickness, or sudden death may disable a household head or a family. Macroeconomic instabilities, generating a harsh inflation and widespread unemployment, may also reduce the real value of household resources significantly.

Under these uncertainties, households face a problem of how to reconcile income fluctuations with a desired stable consumption. This problem can be theoretically captured as a problem of intertemporal consumption smoothing under a stochastic income process. Based on such a framework, recent micro-development literature addresses the effectiveness of formal and informal risk-mitigating mechanisms of households (Rosenzweig 1988; Alderman and Paxson 1992; Paxson 1992; Fafchamps 1992; Morduch 1994, 1995; Udry 1994; Townsend 1994, 1995; Besley 1995; Deaton 1997).

Households have developed several ways to cope with ex post risks of negative income shocks and protect their consumption such as self-insurance and mutual-insurance schemes. The existing literature identifies the following five households' risk-coping strategies. First, households can maintain total nutrition intake while still reducing food and other expenditure.[3] This can be done by the following two ways. One is by changing the quality and composition of food expenditure, while maintaining a certain level of calorie intake. The other is by reducing non-food expenditures such as health and medical expenditures and luxury goods. As an evidence, recent studies on the aftermath of the 1997 currency crisis in Indonesia reveal the importance of consumption reallocation as a coping strategy

[3] Although the reallocation of consumption as a risk-coping behavior may seem obvious, earlier studies have utilized a static framework which does not address the issues of insurance and intertemporal resource allocation (Berhman and Deolalikar 1987; Strauss and Thomas 1995; Subramanian and Deaton 1996).

(Frankenberg, Thomas, and Beegle 1999). Similarly, Moser (1996) finds the importance of food substitutions and expenditure reductions in four poor urban LDC communities.[4]

Second, households can use credit to smooth consumption by reallocating future resources to today's consumption (Eswaran and Kotwal 1989; Besley 1995; Glewwe and Hall 1998).[5] The lack of consumption insurance can be compensated by the access to credit market (Eswaran and Kotwal 1989; Besley 1995). However, poor households usually have only a limited access to credit markets and are constrained from borrowing for a variety of reasons (Morduch 1990; Pender 1996). This can be due to high information cost, lack of assets for collateral (Stiglitz and Weiss 1981; Carter 1988) and policy-induced financial repression (McKinnon 1973). In either case, the existence of credit constraints has important negative impacts on risk-coping abilities of poor households.

Third, households can accumulate financial and physical assets as precautionary means against unexpected income shortfalls (Paxson 1992; Fafchamps and Pender 1997). The forms of precautionary savings include grain storage and cash holdings (Townsend 1995); livestock assets like bullocks (Rosenzweig and Wolpin 1993), goats and sheep (Fafchamps, Udry and Czukas 1998).[6]

Fourth, returns to human capital can be used as a self-insurance device. For instance, faced by negative income shocks, household adult members re-enter the labor market (Walker and Ryan 1990; Kochar 1999). Also, child labor income and disinvestments of education may be used as coping devices against parental income shortfalls (Jacoby and Skoufias 1997; Sawada and Lokshin 2001).[7]

Finally, informal private transfers can serve as self-insurance or mutual-insurance mechanisms. Households can relocate family members, who are altruistically linked, and

[4] Interestingly Olney (1999) showed that cutting consumption was the only viable strategy of American households against a recession in 1930, given the high cost of default. Accordingly, consumer spending collapsed in 1930, turning a minor recession into the Great Depression.

[5] In Korea, there are extensive curb or unorganized money markets where households can obtain loans. The use of credit for consumption is the basic logic of the LC-PIH interpretation of household consumption smoothing.

[6] Theoretically, positive precautionary savings exist when the third derivative of a utility function is positive (Leland 1968).

receive remittances from them in times of emergency (Lucas and Stark 1985; Rosenzweig 1988; Rosenzweig and Stark 1989; Cox and Jimenez 1990; Cox, Eser, and Jimenez 1998).[8] Moreover, through informal arrangements of state-contingent mutual transfers among relatives, friends and neighbors, a household can also achieve consumption smoothing (Lucas and Stark 1985; Rosenzweig 1988; Cox and Jimenez 1990; Fafchamps 1992; Townsend 1994, 1995; Udry 1994; Ravallion and Chaudhuri 1997; Cox, Eser, and Jimenez 1998; Goh, Kang and Sawada 2001; Ogaki and Zhang 2001).[9]

In addition to the above coping strategies, the government can also complement the risk-coping behaviors of households in various ways. Direct public transfers through means-tested targeting or geographical/group targeting can act as a formal safety net for vulnerable households who face temporary difficulties. Moreover, a provision of self-targeting workfare programs can be used as a self-insurance of poor households.

3. The Model

In order to formally and empirically compare different risk-coping strategies, we construct a model of an optimal consumer behavior under uncertain income and possible credit constraints, following Zeldes (1989) and Deaton (1991). Supposing a household's decision maker has a concave instantaneous utility, $U(\bullet)$, of the household consumption, C_t. the households' decision problem is then to choose C_t that maximizes the discounted lifetime utility with a discount factor, β, subject to an intertemporal budget constraints:

[7] In fact, having many children is a conventional form of a precautionary device to cope with unexpected income shocks (Nugent 1985; Tapinos, Mason, and Bravo 1997).

[8] This phenomenon can be interpreted as a self-insurance behavior of a dynasty, which is composed of altruistically linked generations. Note that if generations are altruistically linked, we can assume that a dynastic representative agent solves an infinite-horizon maximization problem (Barro 1972).

[9] The self-enforcement mechanisms of this informal self-interested mutual-insurance scheme could be sustained as sub-game perfect Nash equilibria in a repeated game framework (Coate and Ravallion 1993; Kocherlakota 1996).

$$
\begin{aligned}
&\underset{\{C_t\}}{Max}\ E_t \sum_{t=0}^{T} \beta^t U(C_t) \\
&s.t.\quad A_{t+1} = (1+r_t)(A_t + y_t - C_t) \\
&\qquad A_t + y_t - C_t + z_t \geq 0,\ z_t \geq 0 \\
&\qquad A_0 \ given \\
&\qquad A_T \geq 0,
\end{aligned}
$$

where A is the household assets at the beginning of the period. The maximum amount of borrowing possible for this household is represented by z.[10] Note that r and y represent interest rate and household income, respectively, where this household lives T periods.

When income is stochastic, analytical solutions to this problem cannot be derived in general (Zeldes, 1989). However, we can derive a set of first-order conditions, or Euler equations, that are necessary for an optimum solution by forming a value function and Bellman equation. Let λ represents the Lagrange multiplier associated with credit constraint $A+y-C+z \geq 0$.[11] Combining the envelope condition derived from the first-order conditions, we obtain an augmented consumption Euler equation, which is similar to the equation given by Zeldes (1989):

$$
\begin{aligned}
&U'(C_t) = \beta E_t\left[U'(C_{t+1})(1+r_t)\right] + \lambda_t, \\
&\qquad A_t + y_t - C_t + z_t \geq 0 \ \ if \ \ \lambda_t = 0, \\
&\qquad A_t + y_t - C_t + z_t = 0 \ \ if \ \ \lambda_t > 0.
\end{aligned}
\qquad (1)
$$

As can be seen in Figure 1, we can interpret the Lagrange multiplier, λ, as an indicator of negative welfare effects generated by binding credit constraints.

[10] When z is sufficiently large, this household can lend and borrow freely at a rate of interest, r_t. A case of complete borrowing constraint, where a household cannot borrow at all, can be represented by z=0.

[11] This term, λ, is equal to the increase in expected lifetime utility that would result if the current constraint were relaxed by one unit. Because the household is constrained from borrowing more, but not from saving more, λ enters with a positive sign. Pender's (1996) result, using the Indian ICRISAT data set, implies that λ>0.

4. Econometric Framework

The aim of our econometric framework is to test the implications of the augmented Euler equation (1). Following Zeldes (1989), suppose the rational expectation and the constant relative risk aversion (CRRA) utility, i.e., $U(C_t) = C_t^{1-g}(1-g)^{-1}\exp(q_t)$, where q represents the household's tastes. Then, equation (1) becomes:

$$(2) \qquad \hat{C}_{it+1} = \frac{1}{g}\left[(q_{it+1} - q_{it}) + \log(1 + l_{it}') - \log(1 + e_{it}) + \log(1 + r_{it}) - \log b_i\right],$$

where i is the household index, and e denotes the household's mean zero expectation error. The left hand side variable, $\hat{C}$, indicates the consumption growth rate. Note that the Lagrange multiplier is normalized by the future marginal utility of consumption:

$$(3) \qquad l_{it}' \equiv \frac{l_{it}}{bE_t\left[C_{it+1}^{-g}\exp(q_{it+1})(1 + r_{it})\right]}$$

Then, the estimable equation becomes:

$$(4) \qquad \hat{C}_{it+1} = X_{it}b + \frac{1}{g}\left[\log(1 + l_{it}')\right] + v_{it},$$

where X includes the determinants of preference and, possibly, interest rate, and v_{it} indicates a stochastic error term including an expectation error.[12] To control for the changes in preferences, household characteristics such as household size and head's age and age squared are included (Zelds 1989).

[12] Altug and Miller (1990) argue that time dummies can be reinterpreted as the undiversifiable aggregate risk facing intertemporal decisions under a complete market setting. Also note that taking a second-order Taylor expansion of $\log(1+e)$ around $e=0$, we obtain $\log(1+e) \approx e-(1/2)e^2$. We assume that the squared expectation error is captured by various household's and its head's characteristics.

Now, let C^* represents the optimal consumption in the absence of a current credit constraint. $C^* = C$ if credit constraint is not binding, while $C^* > C$ if credit constraint is binding. Accordingly, we have:

$$\begin{aligned} \lambda_{it}' &= 0 \ \ if \ \ A_{it} + y_{it} - C_{it}^* + z_{it} \geq 0, \\ \lambda_{it}' &> 0 \ \ if \ \ A_{it} + y_{it} - C_{it}^* + z_{it} < 0. \end{aligned} \tag{5}$$

Then, defining cash in hands, H, under the optimal consumption as $H_{it} \equiv A_{it} + y_{it} - C_{it}^* + z_{it}$, we have the following reduced form equation of the cash in hands:[13]

$$H_{it} = W_{it}\gamma + \varepsilon_{it}, \tag{6}$$

where W includes assets, income, and determinants of optimal consumption and maximum amount of borrowing , and ε is an error term which captures unobserved elements and measurement error. Following Hayashi (1985) and Jappelli (1990), we assume that the conditional expectation of desired consumption, C*, can be approximated by a quadratic function and the reduced form for the optimal consumption C* can be expressed as a linear function of observables such as current income, wealth, age, demographic characteristics and so forth as well as quadratic terms for some variables. The maximum amount of borrowing is also a linear function of the same variables.

By linearlizing equation (4), the following econometric model of the augmented Euler equation is derived:

$$\begin{aligned} \hat{C}_{it+1} &= X_{it}\beta + \lambda_{it}' + v_{it}, \\ \lambda_{it}' &= 0 \ \ if \ \ H_{it} \geq 0, \\ \lambda_{it}' &> 0 \ \ if \ \ H_{it} < 0, \\ H_{it} &= W_{it}\gamma + \varepsilon_{it}. \end{aligned} \tag{7}$$

[13] Here, two factors determine whether the constraint is binding (Jappelli 1990). First, it depends on the demand for credit which is represented by the difference between the cash in hands and consumption. The second factor is how much financial intermediaries are willing to supply credit to this individual, which is denoted by z.

The Exogenous Split of Credit Constraints

The conventional empirical approach to estimate equation (7) (e.g., Zeldes 1989; Morduch 1990) ignores the endogeneity of the Lagrange multiplier and splits sample into those likely to be credit constrained, i.e., $\lambda_t>0$, and those not likely to be credit constrained, i.e., $\lambda_t=0$, exogenously. Zeldes (1989) splits the sample on the basis of wealth to income ratio.[14] In developing countries, credit availability may depend on the amount of land due to collateral requirements and standard information-economics reasons.[15] Based on this, Morduch (1990) splits groups by land ownership: none, small-scale, medium-scale and large-scale.

Endogenous Split of Credit Constraints and the Switching Regression Approach

The above exogenous split approach, however, has two problems. First, it is unlikely that a single variable such as income-wealth ratio or land ownership will serve as a sufficient statistic of consumers' ability to borrow (Garcia, Lusardi, and Ng 1997, p.158). Usually, lenders screen credit applicants by multiple indicators of the applicants. Second, the Euler equation (7) indicates that credit constraint is endogenously generated and thus l should be treated as an endogenous variable.

In order to overcome these two issues, an alternative approach is to construct a qualitative response model of endogenous credit constraint by defining an indicator variable of credit constraint, which takes one if the credit constraint is binding and takes zero otherwise. Such a qualitative response model is estimated by Jappelli (1990). In the context of a developing country, a similar framework is employed by Feder *et al.* (1989) and subsequently extended by Baydas, Meyer and Aguilera-Alfred (1994) and Barham, Boucher

[14] For example, a household is regarded as being credit constrained if the estimated total wealth is less than the two months' worth of the average income.

[15] Facing an informational asymmetry between lenders and borrowers, lenders may select borrowers depending on the amount of their land holdings (Carter 1988).

and Carter (1996). Using the US data, Jappelli, Pischeke, and Souleles (1998) estimate a consumption Euler equation, together with an indicator variable of endogenous credit constraints.

A precise measurement of credit constraint is however not straightforward. The direct approach is to utilize information on households' willingness and ability to obtain credit.[16] Yet, such information is not available in a standard household data. Almost no large-scale household surveys include questions about households' credit applications and their results, and households' perceptions toward credit (Scott 2000).

Even in case the indicator variable for credit constraint is not observed, we can apply the estimation method of a switching model with unknown regimes.[17] Following a recent study by Garcia, Lusardi, and Ng (1997), we will estimate a Euler equation augmented by endogenous credit constraints as a switching regression model. Let the Lagrange multiplier, λ', be a linear function of variable Z, i.e., $\lambda' = Z\psi$ with a coefficient vector ψ. Then the estimable augmented Euler equation (7) can be rewritten as follows

$$\hat{C}_{it} = X_{it}\boldsymbol{b}_N + Z_{it}\boldsymbol{y}_N + v_{Nit} \quad if \quad H_{it} \geq 0, \tag{8}$$

$$\hat{C}_{it} = X_{it}\boldsymbol{b}_C + Z_{it}\boldsymbol{y}_C + v_{Cit} \quad if \quad H_{it} < 0, \tag{9}$$

$$H_{it} = W_{it}\boldsymbol{g} + \boldsymbol{e}_{it}, \tag{10}$$

where we assume that errors are independent and identically distributed. Here N and C represent unconstrained and constrained groups, respectively. We cannot observe H directly, but we can estimate the probability of being credit constrained jointly with other parameters by maximizing a likelihood function. We employ the Zimmerman (1998)'s routine that maximizes the likelihood function through the EM algorithm of Dempster, Laird, and Rubin (1977) and Hartley (1978). The testable restriction derived from the theoretical result of the

[16] An alternative approach is to estimate the shadow values of capital for producers and compare these with the prevailing market loan rates. Consistent large gaps between the shadow values of capital and prevailing loan rates reflect the presence of credit constraints (Sial and Carter 1996; Carter and Wiebe 1990).

[17] See Dikens and Lang (1985) for an application for the dual labor market theory.

augmented Euler equation (1) is that the elements of the coefficient vector, $\boldsymbol{\gamma}_N$, are all zero for the non-constrained group.

5. Data and Estimation Results

Data and Descriptive Statistics

We employ a household-level panel data that is collected by the Korean Household Panel Survey (KHPS) in all prefectures except Jeju-do (see Appendix). Based on a stratified random sampling scheme by street block, this data is consisted of household- and individual-level data files. This paper employs data from 1994-95 to 1997-1998. Each round covers from August to July next year. The 1997-98 round is considered to reflect the period of the crisis since it covers from August 1997 to July 1998.

Table 1 shows descriptive statistics. The average age of household heads was 47 years in 1995 and 50 years in 1998. Household size remained stable around 3.7 between 1994 and 1998. Income and expenditure variables are converted into real value by using provincial consumer price indices. Between 1995 and 1997, total income and wage earnings increased by 12 percent and 10 percent, respectively. Private transfers doubled during the same period, but remained to constitute a very small portion (1-2 percent) of total income, and only 18 percent of all households received transfers in 1997. The total amount of household assets rose by 15 percent, while debt grew by 9 percent during this period.

On the other hand, with the onset of the crisis, real total income fell by 24 percent between 1997 and 1998. The major income component, wage income, dropped by 26 percent that was partially offset by the 28 percent increase in debt during this period. While asset declined by a mere 2 percent, private and public transfers rose by 8 and 10 percent, respectively. However, transfers still constituted only 4 percent of total income, and merely 22 percent of total households received transfers. Public transfers consisted predominantly only of pension (82 percent of public transfers on average) since most of the social safety net programs were not yet in place during the initial phase of the crisis, which is the period of our analysis.

With the contraction of the economy, rising unemployment and falling income, total household expenditures dropped by 29 percent between 1997 and 1998. The largest drop

of 63 percent was in the consumption of luxurious items, i.e., leisure activities, dining out and durable goods. On the other hand, food consumption fell by only 15 percent, and expenditures on health and children's educational services, which included extracurricular activities and additional after-school classes, fell by 20 percent. These three categories — food, health & education, and luxury goods—represented 64 percent of total expenditure. Although the consumption of food, health & children's educational services fell in absolute terms during the crisis, they maintained a higher proportion of the total household budget. The share of food expenditure and health & education expenditure increased from 28 percent and 24 percent in 1997 to 31 percent and 25 percent in 1998, respectively, while that of luxury expenditure fell from 12 percent in 1997 to 6 percent in 1998. This suggests that average households were cutting back consumption of non-essential items to preserve food consumption, health expenditure and children's educational spending.[18]

Testable Restrictions and Empirical Results

Following Jappelli (1990) and Garcia, Lusardi, and Ng (1997), the determinants of credit constraints in equation (10), W, include income, income squared, asset, asset squared, age, age squared, gender of household head, marital status of household head, and household member composition. Recall that the testable restriction of our framework is that the elements of the coefficient vector in equation (8), γ_N, are all zero for unconstrained group.

Following this testing strategy, three different specifications of credit constraints for equations (8) and (9) are tested. Throughout the estimation, dependent variable is the annual growth rate of expenditure on nondurables which includes food, clothes, education, health and fuel.

[18] Goh, Kang and Sawada (2001) examine consumption reallocation pattern in Korea during the financial crisis.

Specification A: Zeldes (1989) *Type Test*

In the specification A, the variable matrix, Z, includes initial income. Note that the Lagrange multiplier λ_t is a negative function of current income, y_t, as can be verified in Figure 1 (Zelds 1989). Given other variables, an increase in current income of credit constrained group leads marginal utility of consumption to fall so that Lagrange multiplier should fall (Figure 1).

An augmented consumption Euler equation is estimated with an initial income as an additional independent variable separately for constrained and unconstrained groups using a switching regression. Then testable restrictions are that the income coefficient is zero for unconstrained group and is positive for constrained group.

Table 2 reports the key empirical findings. With respect to the Euler equations, on the other hand, the coefficient of initial income is negative and significant for constrained group but not for unconstrained group. This finding suggests that the reason why Euler equation does not hold in previous studies is credit constraint. We may conclude that the empirical results are in accordance with our theoretical framework.

With respect to the credit constraint equation, the probability of binding credit constraints is a negative quadratic function of income and asset. The age of household head increases significantly the probability to be credit constrained before the crisis although this factor is not significant during the crisis. On the other hand, single-headed households have lower probability to obtain credit before the crisis but higher during the crisis. These findings are in line with the preceding studies based on the US data sets (Garcia, Lusardi, and Ng 1997; Jappelli 1990; Jappelli, Pischeke, and Souleles 1998). While larger households tend to have lower probability to be credit constrained, households with more children tend to have higher probability.

Specification B: *Comparisons of Coping Strategies*

In the specification B, the matrix, *Z*, includes initial income as well as ex post wage income, income from liquidated assets, received private and public transfers as the ex post realization of income components.[19] As Antozoulatos (1994) discussed, if the credit constraint binds today, the Lagrange multiplier, λ, must show an increasing trend in future income. It is easily verified that, *ceteris paribus*, an increase in ex post income will increase the Lgrange multiplier. We simply extend the idea of Antozoulatos (1994) by decomposing ex post income into wage income, income from liquidated assets, received private and public transfers. We expect that ex post income variables are positively related with credit constraint variable for constrained group. For example, in equation (1), an increase in an income component at time $t+1$ leads to higher ex post consumption so that expected marginal utility of ex post consumption falls. Thus, given all other variables, Lagrange multiplier should increase to keep the modified Euler equation.

We believe that our innovation is that, by including these ex post income components in Z, we can test explicitly the respective effectiveness of various risk-coping devices discussed in Section 2. The elements of ψ indicate the degree of their effectiveness against the inaccessibility to credit market. The estimation result for the specification B in Table 3A captures the difference of the effectiveness before and during the crisis while Table 3B shows the estimated result of probability to be credit constrained.

The results of Table 3B are in line with the results in Table 2. Figure 2 compares the estimated kernel density function of the credit-constrained probability using the switching regression results before and during the crisis.[20] As we expected, the probability has significantly increased during the crisis especially after it reached 55 percent probability. For example, assuming the group with above 50 percent as a credit constrained group, the figure shows that the estimated probability density for constrained group increases while the

[19] Alternatively, we can include the first difference of income components, following the ' rule-of-thumb' consumption model (Campbell and Mankiw 1990). However, such an approach imposes a restriction of the same coefficients for today's and tomorrow's income variables, which are never tested. Therefore, we utilize a more general model without an unnecessary parameter restriction, by including ex post income variables as an additional variables.

[20] The width of the density window is the width that minimizes the mean integrated square error assuming a Gaussian kernel of the data.

probability density of unconstrained group fell. According to the empirical results of the specification B, average probability to be credit constrained is 69.0 and 78.4 percent before and during the crisis, respectively.

For the estimation results of Euler equations, the coefficients for household characteristics that are also what we call family preference shifters such as household size, age and age squared are significant only for constrained group but not for unconstrained group before the crisis. During the crisis, however, age and age squared are not significant for both groups.

The coefficient for initial income for constrained group is negative and significant while that for unconstrained group is negative but marginally insignificant. Hence, the result for constrained group is inconsistent with the LC-PIH. The results probably indicate no violation for unconstrained group but a violation for constrained group, which confirms our hypothesis that the major source of violation of the standard Euler equation is the credit constraint. This finding is consistent with the results of specifications A and B.

Each group, however, shows different coping devices. Ex post wage earnings seem to play a significant role in coping with risks before and during the crisis. The effectiveness of ex post wage earnings for unconstrained group, however, disappeared during the crisis. This may reflect the increase in unemployment and a diminishing effectiveness of wage earnings as a coping device. Second, the coefficients for sales of assets are not significantly different from zero for both periods, implying that the sales of assets did not serve as a coping device. This may indicate that households were reluctant to sell their assets to cope with the negative shock since land and stock prices declined sharply.

Interestingly, for constrained group, private transfers did not play a significant role in coping with income shocks before the crisis but did play during the crisis. Private transfers appeared to act as an ex post consumption insurance during the crisis for those ho could not borrow money to smooth consumption. On the other hand, the coefficient on public transfers for constrained group is consistently positive throughout the period. Thus, for those who are credit constrained, public transfers seem to be an effective coping device even during the

initial period of the crisis.[21] For unconstrained group, however, private and public transfers played a reverse role showing significantly different from zero. To examine the reversed effects of ex post private and public transfers for the unconstrained households, we investigate characteristics of each group (Table 4). In Table 4, we assume that an observation is considered if the predicted probability is greater than 0.5 and unconstrained otherwise. According to Table 4, it is obvious that heads of the unconstrained households are relatively old, at age of 66 on average. Hence, our tentative interpretations are that these unconstrained old household heads were making transfers to their children during the crisis by cutting back their consumption. In turn, their children made transfers to the parents. If this story of the two-sided altruism applies to the Korean households during the crisis, then we should observe the negative coefficients on private transfers for the unconstrained households.

6. Conclusion

This paper compares Korean households' risk-coping behaviors before and during the financial crisis in 1997. Empirical findings suggest that there is a set of diversified risk-coping strategies used by households such as consumption reallocation, earnings, assets, private and public transfers. First, households cope with the negative shocks by reducing consumption of luxury items, while maintaining food, education, and health related necessary expenditure. Second, an increase in predicted probability to be credit constrained during the crisis implies that there was a serious negative effect of the credit crunch at the household level. Third, for credit-constrained households, private transfers appeared to act as an ex post coping mechanism during the crisis, although this informal safety net did not contribute well before the crisis. Finally, we do find public transfers to be an effective coping device for those who are credit constrained before and during the crisis.

Our results suggest that the Korean government was successful in providing public safety nets before and during the crisis especially for credit constrained group. However, it is

[21] However, we should recall that the coverage of public transfer schemes is very limited. Social safety net programs were not yet in place during the initial period of the crisis.

theoretically known that as public transfers to unprotected households increase, altruistically-linked private transfer donors may cutback their private transfer provisions. Hence, there is a possibility for public transfers to "crowd out" private transfers reducing benefits from both transfers. Moreover, this crowding out effect could pose difficult targeting problems for policymakers. In some cases, a government subsidy intended only for the poor may indirectly benefit donors who are well off and protected from exogenous shocks.

As a policy implication, the crowding-out relation between private and public transfers should be carefully considered for ongoing and future government subsidies intended for the victims of the financial crisis in the form of unemployment insurance, workfare or other programs.[22]

[22] See Kang and Sawada (2001) for the formal analysis of public and private transfers in Korea.

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Table 1. Summary Statistics of Variables (In 1995 10,000 Korean Won)

	Year	1994-95	1995-96	1996-97	1997-98
	Variable	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)
Basic Household Characteristics					
Age of household head	age	47.13 (13.46)	47.93 (13.64)	48.71 (13.71)	49.67 (13.75)
Dummy =1 if the head is female	d_sex	0.09	0.10	0.11	0.12
Dummy=1 if the head is single	single	0.12	0.13	0.13	0.14
Dummy=1 if the head is salaried Worker	d_oc_1	0.37	0.36	0.34	0.28
Dummy=1 if the head is self-Employed or run own business	d_oc_2	0.25	0.26	0.26	0.26
Dummy=1 if the head' s job is in Agriculture or fishery or is temporal	d_oc_3	0.22	0.22	0.22	0.23
Dummy=1 if the head is unemployed, student, or retired, etc.	other	0.15	0.16	0.18	0.23
Household size	r61	3.76 (1.32)	3.81 (1.38)	3.72 (1.37)	3.69 (1.41)
Adult-equivalent household size	h_size	3.35 (1.18)	3.41 (1.24)	3.35 (1.22)	3.35 (1.25)
Number of children below 15 Years old	child_15	1.02 (1.00)	1.00 (1.01)	0.94 (1.00)	0.85 (1.01)
Income, Expenditure, Assets and Debt					
Non-durable Expenditure (food, Clothes, education, health, and fuel)	nondu_c	803.85 (523.74)	782.78 (571.89)	791.52 (530.76)	647.32 (463.02)
Food expenditure	food	349.27 (219.87)	352.90 (207.79)	351.54 (216.26)	297.99 (177.63)
Education & medical expenditure	ed_me	314.69 (383.37)	293.57 (432.09)	304.17 (371.30)	242.21 (336.21)
Luxury goods expenditure (cultural Activities, entertainment, dining out and durable goods)	luxury	186.62 (460.49)	179.47 (494.30)	147.25 (333.75)	53.98 (86.36)
Total income	t_income	2544.23 (2535.52)	2954.26 (3288.63)	2861.23 (3029.38)	2167.79 (2340.89)
Wage income or earnings from Works	wage_inc	1882.37 (1354.14)	2094.67 (1798.99)	2064.81 (1734.66)	1523.41 (1264.16)
Private transfers received	tr_priv	31.32 (122.23)	45.60 (152.28)	51.38 (214.14)	54.90 (209.45)
Public transfers received	tr_pub	19.55 (126.90)	18.37 (118.36)	19.18 (116.35)	20.99 (134.08)
Sales of assets (land, real estate, securities, and withdrawal of time deposit)	sales	217.51 (1346.40)	252.25 (1485.03)	195.01 (1305.44)	203.62 (1089.94)
Total asset (saving account, share, bond, insurance, loan club)	asset	6657.59 (9376.91)	7319.85 (9439.95)	7681.19 (9403.04)	7533.37 (11895.05)
Number of cars owned	n_cars	(missing)	0.41 (0.54)	0.44 (0.54)	0.43 (0.53)
Outstanding debt (formal banks, non-formal banks, and personal)	debt	772.53 (2248.86)	945.31 (2441.61)	842.02 (2177.78)	1074.34 (5252.27)
Number of households		3038	2778	2629	2375

Table 2. Estimation Results of the Specification A

		Before the Crisis		During the Crisis	
	Regime	constrained	unconstrained	constrained	unconstrained
	Code	Coef. (t-statistics)	Coef. (t-statistics)	Coef. (t-statistics)	Coef. (t-statistics)
First difference of adult equivalent household size	diff	0.119 (9.40)	0.036 (0.90)	0.083 (4.39)	0.070 (1.30)
Age	age	-0.022 (6.52)	0.002 (0.19)	-0.011 (2.11)	0.012 (0.45)
Age squared	Age_2	0.0002 (5.45)	-0.00004 (0.37)	0.00009 (1.94)	-0.00002 (0.14)
Dummy=1 for 1996-1997	d9697	0.0007 (0.06)	0.177 (3.60)		
Log of initial total income	l_tot_inc	-0.014 (2.55)	-0.012 (0.60)	-0.050 (5.45)	-0.040 (1.25)
Constant	_cons	0.734 (8.55)	-0.084 (0.25)	0.495 (3.51)	-0.497 (0.66)
Number of Samples		3950		1975	
Probability of Binding Credit Constraints					
Total income	t_income	1.036 (28.48)		1.194 (27.40)	
Total income squared	t_income2	-0.415 (30.77)		-1.005 (82.65)	
Total asset	Asset	0.447 (52.48)		0.734 (56.71)	
Total asset squared	Asset2	-0.016 (32.83)		-0.141 (120.07)	
Age of head	Age	0.030 (9.68)		0.006 (1.37)	
Age of head squared	age_2	-0.0005 (16.46)		-0.0001 (2.80)	
Dummy=1 if the head is female	d_sex	0.041 (1.25)		-0.735 (17.96)	
Dummy=1 if the head is single	single	-0.393 (13.76)		0.364 (9.70)	
Number of household members	r61	-0.158 (31.26)		-0.129 (18.20)	
Number of members below 15 years old	child_15	0.587 (79.67)		0.436 (42.73)	
Dummy=1 if 1996-97	d9697	0.118 (11.35)			
Constant	_cons	-0.035 (0.46)		0.431 (3.81)	
Number of Samples		3950		1975	
Average Probability to be credit constraint		0.697		0.776	

Table 3A. Estimation Results of the Specification B

		Before the Crisis		During the Crisis	
	Regime	constrained	unconstrained	constrained	unconstrained
	Code	Coef. (t-statistics)	Coef. (t-statistics)	Coef. (t-statistics)	Coef. (t-statistics)
First difference of adult equivalent household size	diff	0.109 (8.74)	0.036 (0.89)	0.076 (4.11)	0.055 (1.02)
Age	age	-0.026 (7.41)	-0.007 (0.60)	-0.009 (1.73)	-0.013 (0.48)
Age squared	Age_2	0.0002 (6.50)	0.00007 (0.65)	0.00008 (1.62)	0.0002 (0.96)
Dummy=1 for 1996-1997	d9697	0.003 (0.27)	0.180 (3.74)		
Log of initial total income	l_tot_inc	-0.025 (4.11)	-0.039 (1.76)	-0.062 (6.02)	-0.069 (1.81)
Log of ex post total wage earnings	l_expowage	0.020 (4.74)	0.037 (2.81)	0.021 (3.92)	-0.011 (0.52)
Log of total sales of assets	l_liq_ast	0.003 (1.25)	0.004 (0.33)	0.007 (1.57)	-0.010 (0.38)
Log of ex post private transfer income	l_exprtrinc	-0.006 (1.76)	0.003 (0.25)	0.011 (1.94)	-0.052 (2.22)
Log of ex post public transfer income	l_exputrinc	0.018 (3.57)	-0.029 (1.69)	0.022 (2.70)	-0.117 (3.35)
Constant	_cons	0.737 (8.42)	0.040 (0.12)	0.368 (2.47)	0.444 (0.60)
Number of Samples		3950		1975	

Table 3B: Probability of Binding Credit Constraints

		Before the Crisis	During the Crisis
		Coef. (t-statistics)	Coef. (t-statistics)
Total income	t_income	1.121	1.165
		(30.69)	(26.15)
Total income squared	t_income2	-0.421	-0.905
		(31.01)	(73.03)
Total asset	Asset	0.423	0.870
		(49.45)	(56.63)
Total asset squared	Asset2	-0.015	-0.184
		(30.88)	(87.26)
Age of head	Age	0.033	0.009
		(10.67)	(1.95)
Age of head squared	age_2	-0.0005	-0.0001
		(18.82)	(3.18)
Dummy=1 if the head	d_sex	0.046	-0.828
is female		(1.42)	(19.76)
Dummy=1 if the head	single	-0.393	0.426
is single		(13.73)	(11.05)
Number of household	r61	-0.0169	-0.154
Members		(33.31)	(21.06)
Number of members	child_15	0.581	0.421
below 15 years old		(78.58)	(40.12)
Dummy=1 if 1996-97	d9697	0.121	
		(11.66)	
Constant	_cons	-0.073	0.424
		(0.94)	(3.67)
Number of Samples		3950	1925
Average Probability to be credit constrained		0.690	0.788

Table 4. Descriptive Statistics During the Crisis by Groups (By 50% probability to be credit constrained)

	Constrained	Unconstrained
Average Probability to be credit constrained	0.814	0.406
Households	1851	124
Age	48.8	64.4
Ex post Private Transfers	46.7	66.0
Ex post Public Transfers	20.3	28.9
Positive Ex post Private Transfer		
Households	371	57
Average Probability to be credit constrained	0.739	0.432
Age	57.9	69.1
Ex post Private Transfers	227.3	137.8
Ex post Public Transfers	12.9	18.6
No Ex post Private Transfers		
Households	1480	67
Average Probability To be credit constrained	0.832	0.384
Age	46.5	60.5
Ex post Private Transfers	0	0
Ex post Public Transfers	22.2	38.4
Positive Ex post Public Transfers		
Households	272	58
Average Probability to be credit constrained	0.742	0.421
Age	58.5	71.4
Ex post Private Transfers	89.6	64.2
Ex post Public Transfers	134.6	59.3
No Ex post Public Transfers		
Households	1579	66
Average Probability to be credit constrained	0.826	0.393
Age	47.1	58.3
Ex post Private Transfers	39.1	67.7
Ex post Public Transfers	0	0

Figure 1. Consumption Smoothing under Binding Credit Constraints

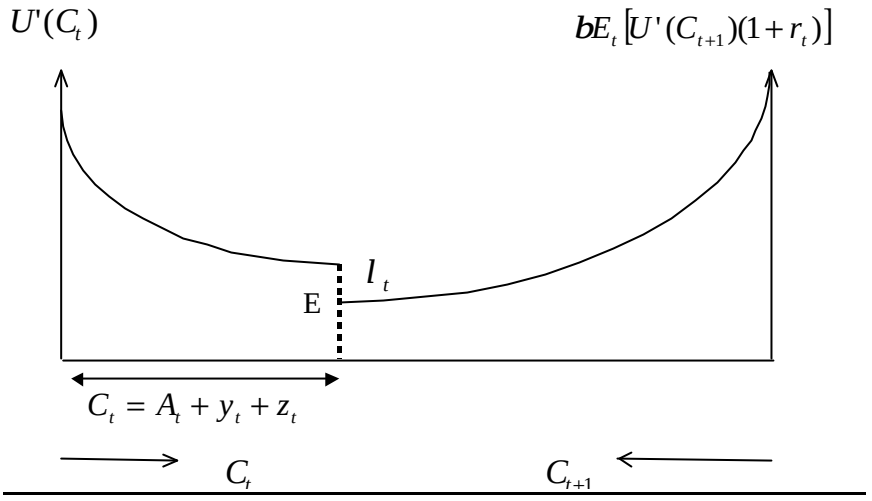
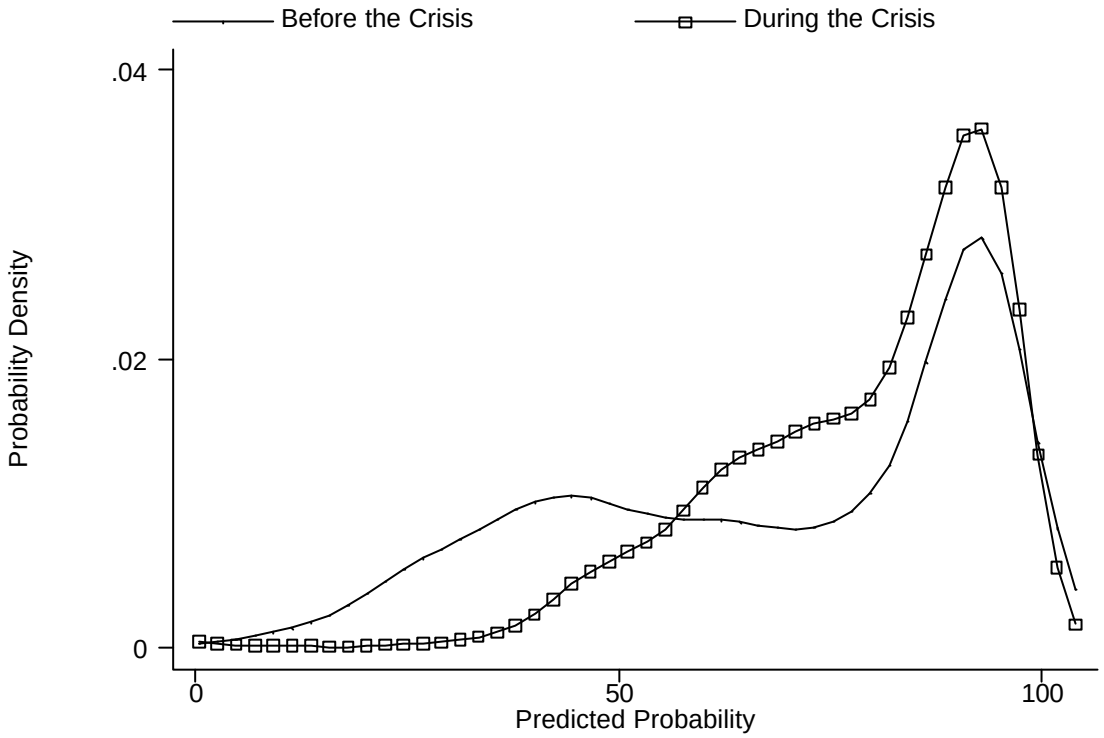


Figure 2. Kernel Density Estimates of Probability to be Credit Constrained Before and During the crisis



Appendix: The data

The Korea Household Panel Survey (KHPS) data has a rectangular form, following the Panel Survey of Income Dynamics (PSID) in the US. There are no replacements of households, but household split-offs due to marriage or other reasons are included. The survey was conducted in all Korean prefectures except Jeju-do through stratified random sampling by street blocks; eight and seven households from each street block are randomly selected in large and small cities, respectively. The data consists of multi-purpose surveys in household and individual modules. Tables A1-A3 presents some information on the KHPS. This study excludes data of the first and second waves because definitions of some variables and periods covered are not comparable with those in the later waves. Thus, this study examines periods from 1995 to 1998, inclusive of the initial period of the Asian financial crisis.

Table A1. Summary Statistics of Variables

Year identification	Wave	Period Covered
1993	1	Jan. 92 - Dec. 92
1994	2	Apr. 93 - Mar. 94
1995	3	Aug. 94 - Jul. 95
1996	4	Aug. 95 - Jul. 96
1997	5	Aug. 96 - Jul. 97
1998	6	Aug. 97 - Jul. 98

Table A2. Summary Statistics of Variables

	1993	1994	1995	1996	1997	1998
1993	4547	3609	3045	2712	2571	2266
1994		16	13	11	9	7
1995			50	41	39	30
1996				69	55	39
1997					50	46
1998						80
Dropouts		938	564	333	141	305
New Entry (Split-offs)		16	63	121	153	202
Dropout rate		20.6%	15.6%	10.9%	5.2%	11.9%
Total	4547	3625	3108	2833	2724	2468

Table A3. Sample Size

	1994	1995	1996	1997	1998
Household Lacking Consumption Data	0	4	18	20	0
Household Lacking Household Head Education Data	220	61	46	80	70
Total Number of Households in Working Panel	3567	3008	2701	2561	2238