Financial Knowledge and Financial Fragility: A Consideration of the Neighborhood Effect

Kyoung Tae Kim[a], Jae Min Lee[b] and Sharon A. DeVaney[c]

This study explores the association between financial knowledge and financial fragility. Data from the 2015 National Financial Capability Study were used to create an index of financial fragility. Relationships between this index and three different measures of financial knowledge were assessed. To mitigate potential endogeneity in the financial knowledge measures, such as neighborhood effect defined as social interactions or characteristics of communities that influence socioeconomic and health behaviors or outcomes of individuals, the neighborhood average education level in US zip code units was used as an instrumental variable. The results from the baseline Ordinary Least Squares regression models and Two Stage Least Squares (2SLS) regression models indicated a negative relationship between financial knowledge and financial fragility; the effect was greater when the instrumental variable was used. Our findings with the neighborhood effect suggest which groups could be a focus for future research as well as offering practical interventions. Further, when designing and implementing educational and behavioral interventions, the knowledge-based approach should gain continued support from financial education, planning, and counseling programs.

Keywords: financial fragility, financial knowledge, instrumental variable, National Financial Capability Study

Financial fragility often refers to the capacity of households to come up with $2,000 in 30 days to cover an unexpected need (Lusardi, 2011). It is a concern that US households lack financial preparation for foreseen and unforeseen events. Households with a lack of financial planning and preparing for life events would not be able to properly respond to them due to limited personal financial resources to depend on (Lusardi & Mitchell, 2013; Lusardi et al., 2011; Lusardi et al., 2018).

Using the National Financial Capability Survey (NFCS) data, Lusardi (2011) found that about half of the survey respondents had not set aside emergency funds to cover expenses for three months in case of illness, job loss, economic downturns, or other emergencies. Furthermore, approximately 60% of the NFCS non-retired survey respondents had not tried to figure out how much they would need to save for retirement and another 60% of the respondents who had financially dependent children had not set aside money for the college education of their children. Being prepared for emergencies can serve as a form of insurance to reduce the risk of economic hardship and determine other financial outcomes (Gjertson, 2016). Sherraden et al. (2018) also noted that both the current financial burden and the expected financial burden can influence household financial behavior and well-being. For example, the growing household credit card balances accompanied by persistent delinquencies (Federal Reserve Bank of New York, 2019; Jappelli et al., 2013) can reflect household financial instability and its potential harm to household finance. Managing both the payment of regular monthly bills and making payments on credit card debt can be challenging (Anderloni et al., 2012). The inability to deal with current expenses is likely to impact the ability to manage future expenses.

It is important to adopt a broad definition of financial fragility to assess who is in current and potential financial distress. In addition, understanding factors that affect the level

[a]*Associate Professor, Department of Consumer Sciences, University of Alabama, 316-C Adams Hall, Box 870158, Tuscaloosa, AL, 35487. E-mail: ktkim@ches.ua.edu*
[b]*Associate Professor, Department of Family Consumer Science, Minnesota State University, Mankato, 102 Wiecking Center, Mankato, MN, 56001. E-mail: jae-min.lee@mnsu.edu*
[c]*Professor Emeritus, Division of Consumer Science, School of Hospitality and Tourism Management, Purdue University, 3001 W. 33rd Street, # 305, Sioux Falls, SD, 57105-4287. E-mail: devaneysa5761@gmail.com*

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of financial fragility is salient. Households might be able to get a credit card, sell assets, get loans, or ask for help from relatives or friends to meet unexpected expenses. However, they still need to cover basic living costs and repay debt during an emergency (Ampudia et al., 2014). It is possible that households could experience greater financial distress in the future if they cannot handle current expenses. The inability to manage current expenses and prepare for future emergencies has been studied to understand whether people are prepared to make effective financial decisions based on their financial knowledge (Anderloni et al., 2012; Lusardi, 2011; Lusardi & Mitchell, 2009). However, there is a lack of congruence between financial knowledge and financial behavior. In addition, financial knowledge can include the characteristics of the community (e.g., neighborhood effect). These characteristics are not directly measured by observed, reported levels of financial knowledge and there may be variation in the level of these neighborhood effects (Dietz, 2002; Ellen & Turner, 1997; Lachance, 2014).

Therefore, the primary purpose of this study was to examine the extent to which financial knowledge is associated with financial fragility by including the social effect of financial knowledge. To explore financial fragility across various areas in household finances, we constructed an index of financial fragility based on five questions available in the 2015 National Financial Capability Study (NFCS). Furthermore, we considered the potential endogeneity issue of financial knowledge by proxying the education level of neighborhoods for the instrumental variable estimation. In essence, we attempted to capture the neighborhood effect on financial knowledge. Results from this study could provide insight for researchers and practitioners exploring the role of financial knowledge on financial fragility.

Literature Review and Hypotheses

Financial Fragility

Financial fragility has been used to refer to the ability to obtain emergency funds in many studies (Lusardi, 2011; Lusardi et al., 2011); however, there is a great deal of variation in measuring the seemingly same concept among studies. Lusardi et al. (2011) used a single measure for financial fragility to assess the coping ability of households to access an emergency fund (e.g., come up with $2,000 in 30 days) while other studies have used multiple measures and have included debt burden and net worth. Lusardi et al. (2018) used financial security variables such as debt-to-asset ratio, loan-to-home value ratio, debt-to-liquid asset ratio, and net worth level based on each threshold to assess financial fragility of older Americans while Lusardi and Mitchell (2013) used the four financial security variables and the ability to deal with an emergency (i.e., coming up with $2,000 in 30 days).

Financial capability has covered some similar aspects such as ability to manage and take control over finances. Xiao et al. (2014) and Xiao and O'Neill (2018) used financial capability measured as a level of financial literacy and desirable financial behaviors. Lusardi (2011) measured financial capability through how well people make ends meet, plan ahead, choose and manage financial products, and have skills and knowledge for financial decisions. Financial capability includes knowledge and competencies to make informed decisions and the performance of positive behaviors (Johnson & Sherraden, 2007). Thus, financial capability is a broader concept that includes the ability to apply appropriate knowledge and skills in addition to behavioral practices, not just financial stability or current financial conditions.

Financial Knowledge

Studies have operationalized financial knowledge by employing objective (i.e., test scores) and subjective measures (i.e., self-assessments, "how would you assess your overall financial knowledge?"). Some studies have used objective financial knowledge based on the correct answers to the questions about basic financial concepts and principles and others have used both objective and subjective financial knowledge (Allgood & Walstad, 2016; Robb & Woodyard, 2011).

It has been argued that financial knowledge improves the ability to deal with financial information, increases awareness about the consequences of financial decisions, such as investing, saving, and borrowing (Anderloni et al., 2012; Lusardi, 2011). Also, financial knowledge promotes positive financial behavior through its impact on skills and subjective evaluation of financial knowledge (Hung et al., 2009). People with greater financial knowledge are described as those who are more likely to effectively manage their finances and take control, ranging from day-to-day money management to planning and preparation for their financial future (Anderloni et al., 2012). Subjective or perceived financial knowledge also promotes positive financial

behavior, such as retirement planning and performance on a hypothetical investment task after controlling for objective financial knowledge (Parker et al., 2012) and a basic estate planning proxied by having a will (Kim & Stebbins, 2021).

Financial literacy deficiencies are related to ineffective financial practices. For example, households with a lack of financial literacy were less likely to plan for retirement and to accumulate wealth and they were more likely to use high cost borrowing and to have debt repayments (Disney & Gathergood, 2013; Kim & Lee, 2018; Lusardi & Mitchell, 2013).

Despite the evidence that attributes financial knowledge to positive financial outcomes (Allgood & Walstad, 2016; Hilgert et al., 2003; Kim et al., 2019; Lusardi, 2011; Lusardi & Mitchell, 2013), empirical studies have shown heterogeneity in the relationship between financial knowledge and positive financial behavior. Some studies have found that financially knowledgeable consumers are more likely to behave in financially responsible ways (Hilgert et al., 2003; Perry & Morris, 2005). However, the positive effect of financial knowledge on financial behavior was not substantiated (Robb & Sharpe, 2009) or financial knowledge by itself was not found as a strong factor of positive financial behavior (Robb & Woodyard, 2011).

Neighborhood Effect in Personal Finance

Lusardi and Mitchell (2014) discussed the issue of endogeneity in financial knowledge and suggested that the effects of financial knowledge that ignore the possible endogeneity could be underestimated. Mixed empirical results regarding the association between financial knowledge and financial behavior have also renewed attention to the mechanisms of endogeneity issue of financial knowledge, such as the neighborhood effect. The neighborhood effect is defined as social interactions or characteristics of communities that influence socioeconomic and health behavior or outcomes of individuals (Dietz, 2002; Ellen & Turner, 1997; Kling et al., 2007). Studies have tested observed associations between neighborhood characteristics and individual behavior and outcomes based on residential variables (Becker &Murphy, 2000; Ellen & Turner, 1997; Haveman & Wolfe, 1995; Jencks & Mayer, 1990; Kling et al., 2007). However, evidence on the direction and magnitude of neighborhood effects and validity of the methods on behavior and outcomes has been questioned (Dietz, 2002; Kling et al., 2007).

Lachance (2014) focused on the neighborhood effect to handle the endogeneity issue of financial knowledge. The study suggested an instrument of financial knowledge based on the share of college degree holders in each Zip Code Tabulation Area (ZCTA). Lachance proposed and tested the idea that when people are exposed to financially knowledgeable neighbors, they become more financially knowledgeable themselves. That is, how much individuals know about finances was measured by assessing the proportion of well-educated people that lived in their neighborhood. The result was robust even after controlling for other factors, including getting advice from financial professionals, receiving financial education, and living in an area with a greater proportion working in the financial industry.

Hypotheses

The following hypotheses were proposed.

> H1: Financial knowledge will be negatively associated with the level of financial fragility.
>
> H2: Those living in the area with a higher proportion of college or higher degree holders will have greater financial knowledge.
>
> H3: Those living in an area with a higher proportion of college or higher degree holders will be less likely to experience financial fragility.

Method

Data and Sample

This study used data from the 2015 National Financial Capability Study (NFCS) administered from June through October of 2015 and commissioned by the Financial Institution Regulatory Authority (FINRA) Investor Education Foundation to explore the financial capability of US households. The data included demographic, attitude, behavior, and financial knowledge characteristics. Based on established online panels consisting of millions of individuals, the data were drawn using non-probability quota sampling (Mottola & Kieffer, 2017). The NFCS was administered on a state-by-state basis with approximately 500 observations from each state (for all 50 states) and the District of Columbia. The number of original survey respondents in the 2015 NFCS was 27,564. Further details on the NFCS dataset are discussed by Mottola and Kieffer (2017).

The analytic sample for this study was 22,308 respondents. The following respondents were deleted: If the respondent chose "prefer not to say" as their answer to the questions dealing with objective financial knowledge, and where the respondent chose "prefer not to say" or "don't know" as their answer to the financial fragility, perceived knowledge, financial education, and other control variables.

Dependent Variable: Financial Fragility Index

Based on the literature on financial fragility (e.g., Lusardi et al., 2011), we selected five financial fragility questions from the 2015 NFCS dataset. More details of these questions can be found in Table 1. Then, a financial fragility index was constructed using the iterated principal factor method to capture the extent to which each variable contributed to the shared variation among financial fragility

TABLE 1. Financial Fragility, Financial Knowledge and Financial Education of all Households, 2015 NFCS

Variable	Description	Percentage
Financial fragility		
# of financial fragility behaviors (0–5)		Mean (S.D.): 1.90 (1.49)
Difficulty in paying bills	"In a typical month, how difficult is it for you to cover your expenses and pay all your bills?"	50.53%
No emergency fund savings	"Have you set aside emergency or rainy day funds that would cover your expenses for 3 months, in case of sickness, job loss, economic downturn, or other emergencies?"	49.90%
An experience of overdraw	"Do you overdraw your checking account occasionally?"	17.76%
Not having abilities to come up with $2,000	"How confident are you that you could come up with $2,000 if an unexpected need arose within the next month?"	33.85%
Credit card revolving	"In some months, I carried over a balance and was charged interest"	38.16%
Objective financial knowledge		
# of correct answers (0–5)		Mean (S.D.): 2.99 (1.41)
Interest	"Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?"	78.00%
Inflation	"Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?"	62.78%
Bond price	"If interest rates rise, what will typically happen to bond prices?"	30.72%
Mortgage	"A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less."	78.70%
Portfolio	"Buying a single company's stock usually provides a safer return than a stock mutual fund."	49.03%
Perceived financial knowledge	"On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you assess your overall financial knowledge?"	Mean (S.D.): 5.29 (1.20)
Financial education	"Was financial education offered by a school or college you attended, or a workplace where you were employed?"	23.72%

Note. Weighted results.

variables. Then the Bartlett (1937) method was used to obtain a composite index of financial fragility. Cronbach's alpha for financial fragility was 0.6448.

Financial Knowledge Variables

This study used three alternate measures of objective financial knowledge based on the five questions presented in Lusardi and Mitchell (2011). The topics of the five financial knowledge questions include interest, inflation, bond price, mortgage, and portfolio. Following the approach of Lusardi and Mitchell (2009) and van Rooij et al. (2011), the first measure, financial knowledge index, was constructed using the iterated principal factor method and the Bartlett method. Cronbach's alpha for objective financial knowledge variables was 0.6096.

Two alternative measures of objective financial knowledge were used to evaluate the robustness of this constructed index. The first alternate measure of objective financial knowledge was the number of correct answers, so the variable could range from 0 to 5. The second alternative measure of objective financial knowledge was a binary indicator variable coded as 1 if the respondent answered all questions correctly, and 0 otherwise. Further, perceived financial knowledge was based on a self-assessment about the level of financial knowledge using a Likert-type scale that ranged from 1, very low, to 7, very high. Financial education was an indicator variable coded 1 if the respondent reported participating in financial education at an educational institution or at a workplace, and 0 otherwise.

Control Variables

This study included several socio-demographic characteristics. The control variables included: Age of the respondent, gender of the respondent (male, female), education of the respondent (less than high school, high school, some college, bachelor degree, post-bachelor degree), and marital status of the respondent (married, single, separated/divorced/widowed). In addition, the following control variables included: Household income (less than $15,000, $15,000-$24,999, $25,000-$34,999, $35,000-$49,999, $50,000-$74,999, $75,000-$99,999, $100,000-$149,999, $150,000 or more), and employment status of the respondent (full-time salary worker, self-employed, part-time salary worker, homemaker, student, disabled, unemployed, retired), presence of dependent child (yes/no), and race of the respondent (White, Black, Hispanic, Asian/others). Two additional variables were controlled: Transitory income shock of the respondent or household (yes/no), and ownership of health insurance (yes/no) of the respondent.

The state of residence was also included as a control variable to account for the variation in financial behavior due to the unobserved regional sentiments towards various financial behaviors or differences in state-level policies. In the NFCS dataset, respondents have been self-selected (Mottola & Kieffer, 2017). Most control variables were based on individual (respondent) characteristics instead of household characteristics.

Data Analyses: Two-Stage Least Squares (2SLS) Regression

To investigate the association between financial knowledge and financial fragility, the study employed a two-stage least squares (2SLS) regression analysis that uses exogenous variation in the average education level of neighborhoods to operationalize the endogenous financial knowledge variable. This instrumental variable (IV) estimation could mitigate the potential endogeneity issues caused by omitted variables and measurement errors. Following the findings based on the neighborhood effect on financial knowledge by Lachance (2014), an instrument variable was created for objective financial knowledge using the education level of neighborhoods. The education level of neighborhoods was measured by the share of college degree holders in each Zip Code Tabulation Area (ZCTA) obtained from the 2011 to 2015 American Community Survey (ACS) 5-Year Estimates.

First, this study estimated the following first-stage regression for an individual i living in zip code area z:

$$FK_{iz} = I_z + X_{iz} + \varepsilon_{iz} \quad (1)$$

Where

FK_{iz} = objective financial knowledge of individual i (z = zip code area)

I_z = vector of the instrument (average education level)

X_{iz} = vector of socio-demographic characteristics of individual i

ε_{iz} = error term

The next step was to regress financial fragility on this predicted value of financial knowledge and other covariates.

$$Y_i = \widehat{FK}_{iz} + X_i + u_i \quad (2)$$

Where

Y_i = financial fragility of individual *i*

$\widehat{FK}_{iz}$ = predicted value of objective financial knowledge of individual *i*

X_i = vector of socio-demographic characteristics of individual *i*

u_i = error term

Results

Descriptive Statistics of the Sample

As shown in Table 1, the mean number of fragility behaviors was 1.9. Almost half of the sample was involved in two of the five fragility indicators: Difficulty in paying bills (50.5%) and not having emergency fund savings (49.9%). About 18% experienced an overdraft in their checking account while 33.9% reported that they could not come up with $2,000 within 30 days. More than 38% were credit card revolvers. With respect to the financial knowledge and financial education variables, the mean of correct answers to the five financial knowledge questions was 3.0 while the mean of perceived financial knowledge was 5.3. Almost one-quarter (23.7%), had received and participated in some form of financial education. Full results of descriptive statistics of the sample are available from the authors upon request.

Multivariate Results

Table 2 shows the results from baseline Ordinary Least Squares (OLS) regressions with three different objective financial knowledge measures (see Columns (1)–(3)). Financial knowledge was negatively related to financial fragility across different measurements even after various socio-demographic characteristics were controlled. In particular, a one-unit increase in three objective financial knowledge measures decreased an index of financial fragility by 0.0586, 0.0443, and 0.1173, respectively. H1 (Financial knowledge will be negatively associated with the level of financial fragility) was supported.

TABLE 2. Multivariate analyses of Financial Fragility from Ordinary Least Squares (OLS) and Instrumental Variable (IV) Approaches, 2015 NFCS

Variable	OLS estimates with different direct measures of financial knowledge			IV estimates of financial knowledge		
	(1)	(2)	(3)	(4)	(5)	(6)
Objective financial knowledge						
Financial knowledge index	−0.0586*** (0.0062)	–	–	−0.5595** (0.1787)	–	–
Total number correct	–	−0.0443*** (0.0044)	–	–	−0.3842** (0.1212)	–
All five correct	–	–	−0.1173*** (0.0159)	–	–	−1.3269** (0.4189)
Perceived financial knowledge	−0.1634	−0.1628	−0.1644	−0.1330***	−0.1308***	−0.1369***
Age of respondent	−0.0027	−0.0027	−0.0031	0.0046	0.0043	0.0015
Male (ref: Female)	−0.0693	−0.0681	−0.0752	0.0600	0.0570	0.0207
Race (ref: White)						
Black	0.1475***	0.1471***	0.1618***	−0.0373	−0.0226	0.0872**
Hispanic	−0.0230	−0.0230	−0.0143	−0.1238**	−0.1132**	−0.0469*
Asian/others	−0.0097	−0.0098	−0.0035	−0.0577	−0.0534	0.0049
Marital status (ref: Married)						
Single	−0.0025	−0.0023	0.0012	−0.0322	−0.0267	0.0059
Separated/divorced/widowed	0.0580***	0.0577***	0.0572***	0.0498*	0.0483*	0.0407*
Presence of dependent child	0.1652***	0.1648***	0.1700***	0.0977***	0.1003***	0.1383***

TABLE 2. Multivariate analyses of Financial Fragility from Ordinary Least Squares (OLS) and Instrumental Variable (IV) Approaches, 2015 NFCS *(Continued)*

Variable	OLS estimates with different direct measures of financial knowledge			IV estimates of financial knowledge		
	(1)	(2)	(3)	(4)	(5)	(6)
Education (ref: Less than high school)						
High school	−0.0222	−0.0218	−0.0350	0.0997	0.0897	−0.0255
Some college	−0.0358	−0.0349	−0.0591	0.2161*	0.1972*	−0.0001
Bachelor degree	−0.1362***	−0.1343***	−0.1622***	0.2152	0.1954	−0.0114
Post-bachelor degree	−0.1112***	−0.1086***	−0.1360***	0.2703	0.2525	0.0593
Employment status (ref: Full-time salary worker)						
Self-employed	−0.0427	−0.0422	−0.0436	−0.0127	−0.0119	−0.0175
Part-time salary worker	−0.0366	−0.0366	−0.0316	−0.0728**	−0.0689**	−0.0268
Homemaker	0.0261	0.0261	0.0296	0.0185	0.0196	0.0519*
Student	0.0274	0.0281	0.0249	0.0791*	0.0787*	0.0624
Disabled	0.2869***	0.2858***	0.2915***	0.2160***	0.2141***	0.2561***
Unemployed	0.1605***	0.1610***	0.1619***	0.1838***	0.1854***	0.2005***
Retired	−0.1416***	−0.1413***	−0.1362***	−0.1828***	−0.1757***	−0.1282***
Household income (ref: Less than $15,000)						
$15,000–$24,999	−0.1858***	−0.1861***	−0.1913***	−0.1466***	−0.1528***	−0.2028***
$25,000–$34,999	−0.3877***	−0.3875***	−0.3925***	−0.3418***	−0.3447***	−0.3871***
$35,000–$49,999	−0.5203***	−0.5201***	−0.5318***	−0.3984***	−0.4082***	−0.5039***
$50,000–$74,999	−0.7631***	−0.7625***	−0.7763***	−0.6033***	−0.6133***	−0.7219***
$75,000–$99,999	−0.9062***	−0.9052***	−0.9180***	−0.7445***	−0.7520***	−0.8403***
$100,000–$149,999	−1.0653***	−1.0636***	−1.0794***	−0.8145***	−0.8251***	−0.9200***
$150,000 or more	−1.1142***	−1.1116***	−1.1247***	−0.8493***	−0.8533***	−0.9098***
Transitory income shock (ref: No)	0.3377***	0.3377***	0.3392***	0.2928***	0.2966***	0.3017***
Covered by health insurance (ref: No)	−0.2192***	−0.2189***	−0.2225***	−0.1711***	−0.1738***	−0.1982***
Recipients of financial education	−0.0455	−0.0448	−0.0489	0.0318	0.0300	0.0114
Regional fixed effect (State of residence)	Included	Included	Included	Included	Included	Included
Intercept	1.7644	1.8937	1.8398	0.8260	2.0442	1.4870
Adjusted R^2	0.3720	0.3723	0.3701	0.1897	0.2091	0.2080
Durbin–Wu–Hausman F statistics	–	–	–	10.1308**	9.8967**	10.4933**

Note. Columns (4)–(6) report results from the IV estimates of different direct measures of financial knowledge in columns (1)–(3), respectively. Robust standard errors for financial knowledge variables in parentheses. Results from the first stages of IV estimates are available from the authors upon request.

Significance levels are indicated by $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Columns (4)–(6) in Table 2 present the second stage of the two-stage IV estimates. The results from the first stage showed that the proportion of college degree holders in a zip code area was positively associated with the financial knowledge (endogenous) variable even after controlling for all other independent variables, meaning that levels of all three financial knowledge measures increased as the rate of college degree holders in each zip code increased. The significant results from the Durbin–Wu–Hausman test indicated that there was an issue of endogeneity in financial knowledge. Therefore, H2 (Those living in the area with a higher proportion of college or higher degree holders will have greater financial knowledge) was supported.

Even after accounting for endogeneity of financial knowledge, the negative effect of financial knowledge on the

financial fragility index remained statistically significant and the estimated marginal effect of financial knowledge increased, indicating the stronger effect of the instruments. Specifically, a one-unit increase in the instrumented objective financial knowledge variables decreased the index of financial fragility by 0.5595, 0.3842, and 1.3269, respectively. The robustness of this result held across the three financial knowledge measures, confirming the negative association between objective financial knowledge and financial fragility even after the financial knowledge was being instrumented. H3 (Those living in the area with a higher proportion of college or higher degree holders will be less likely to experience financial fragility) was supported.

With respect to the socio-economic characteristics, the effects of the variables on financial fragility were different across the types of financial knowledge measurement. Some variables were significant across all types of financial knowledge measurements and models: The separated/divorced/widow(er)s, those with dependent child, the disabled, the unemployed, and those who experienced transitory income shock were more likely to be financially fragile than the reference groups (i.e., married, those without dependent children, those with less than high school educational attainment, full-time salary workers, those who did not experience transitory income shock) while the retired, those with higher income levels, and those with health insurance had lower likelihood of being financially fragile compared to the reference groups (i.e., full-time salary workers, those without health insurance).

Other variables were significant only in certain models (either OLS or the 2SLS model) or with certain financial knowledge measurements. Black respondents, those with some college level of educational attainment (e.g., associate degree holders or college dropouts), homemakers, and students had higher likelihood of being financially fragile while Hispanic respondents, those with higher educational attainment (e.g., bachelor degree holders, post-bachelor degree holders), and part-time salary workers were less likely to be financially fragile compared to the reference groups (i.e., White, those with less than high school educational attainment level, full-time salary workers). However, the age of the respondent was not significant in any of the models.

Robustness Check

To report alternative specifications that test the hypotheses, we conducted additional analyses using a binary dependent variable of financial fragility; the ability to cope with an emergency (i.e., come up with $2,000 within 30 days) (Lusardi et al., 2011). Table 3 shows the results from baseline Probit

TABLE 3. Robustness Check Of Financial Fragility from Probit and Instrumental Variable (IV) Approaches, 2015 NFCS

Variable	Probit estimates with different direct measures of financial knowledge			IV estimates of financial knowledge		
	(1)	(2)	(3)	(4)	(5)	(6)
Objective financial knowledge						
Financial knowledge index	−0.0830*** (0.0131)	–	–	−0.9091*** (0.1267)	–	–
Total number correct	–	−0.0635*** (0.0094)	–	–	−0.6415*** (0.0925)	–
All five correct	–	–	−0.2032*** (0.0376)	–	–	−2.2595*** (0.4189)
Control variables	Included	Included	Included	Included	Included	Included
Regional fixed effect (State of residence)	Included	Included	Included	Included	Included	Included
Intercept	1.7998	1.9839	1.8972	−0.3712	1.6517	0.7152
Pseudo R^2	0.2556	0.2559	0.2550	–	–	–
Wu–Hausman F statistics	–	–	–	13.27***	13.12***	14.06***

Note. Columns (4)–(6) report results from the IV estimates of different direct measures of financial knowledge in columns (1)–(3), respectively. Robust standard errors for financial knowledge variables in parentheses. Results from the first stages of IV estimates are available from the authors upon request.
Significance levels are indicated by $^{***}p < .001$.

regressions and the second stage of the two-stage IV estimates. We used *ivprobit* in STATA 15.1 Software. Results were consistent across different measurements of financial knowledge, and we found negative associations between objective financial knowledge and financial fragility. After financial knowledge was instrumented, the estimated marginal effect of financial knowledge became stronger. This effect was consistent with our main analyses.

Discussion, Implications, and Limitations

It has been discussed that the effects of financial knowledge that ignore the possible endogeneity could be underestimated (Lusardi & Mitchell, 2014). To better estimate the effect of financial knowledge by accounting for a possible endogeneity issue, we explored the association between objective financial knowledge and financial fragility using an instrumental variable estimation. To generate exogenous variation in financial knowledge, this study used an instrument with the average education level of neighborhoods by the unit of the US zip code based on the underlying assumption about the neighborhood effect of financial knowledge.

The results from the Ordinary Least Square (OLS) and the Two Stage Least Squares (2SLS) regressions were similar, and both of these results showed a negative association between financial knowledge and financial fragility, supporting H1 (Financial knowledge will be negatively associated with the level of financial fragility). By diversifying the measures of financial knowledge in both OLS and IV models, our results suggest various ways to measure the role of financial knowledge beyond a dichotomized combination of single objective and subjective financial knowledge. However, the marginal effect of financial knowledge increased when it was instrumented and the model with the valid instrumental variable can more accurately estimate the role of financial knowledge. From the significant effects of the instrumental variable and the robustness of the instrumental models, this study confirms the community network effect, and this was consistent with previous results (Lachance, 2014), supporting H2 (Those living in the area with a higher proportion of college or higher degree holders will have greater financial knowledge). The results also indicated that those living in a more educated or knowledgeable neighborhood tended to be less financially fragile than those living in less educated or knowledgeable neighborhoods (Bucher-Koenen & Lusardi, 2011), supporting H3 (Those living in the area with a higher proportion of college or higher degree holders will be less likely to experience financial fragility). The results were robust across all three types of instrumented financial knowledge models and the results imply that the use of instrumented financial knowledge was valid in any form of our financial knowledge measures.

In addition, perceived financial knowledge became significant when instrumented financial knowledge was used in the model. Although perceived financial knowledge does not reflect actual knowledge because people do not know the extent of their knowledge, it promotes healthy financial behavior and outcomes, so does objective knowledge (Hung et al., 2009). Hung et al. (2009) also noted that financial skills, perceived financial knowledge, and attitudes that could contribute to better financial behavior can be related to actual financial knowledge. Many of these characteristics are likely influenced by neighborhood effects, such as access to resources such as banks, financial advisers and counselors, lenders and other institutions, quality of programs, and social interactions with knowledgeable people. There may be a role for policymakers to consider what resources are available and whether they are appropriate for various communities. Thus, our findings may suggest further analysis of other variables that might be associated with the neighborhood for potential externalities.

A significant relationship between financial education experience and financial fragility was not supported in this study. Results do not necessarily rebut the entire effect of financial education. Financial education experience itself did not provide enough details of its characteristics (e.g., types, delivery methods, topics, content) to capture the underlying difference in the effect. For example, individuals may not acquire or build up financial knowledge and skills necessary for better financial behavior and outcome only through formal financial education from the public and private organizations (e.g., schools, employers, and churches). Other sources of financial education, such as financial socialization that occur in non-formal financial education settings (e.g., parents, relatives, friends) can increase the effectiveness of financial education by supplementing one another (Alex & Amos, 2014; Kim et al., 2021). Financial education may help lessen the negative impact of unexpected events or less optimal financial decisions on household finances (Anderloni et al., 2012). The direct effect of financial education experience could be investigated by future research.

Concerning sociodemographic characteristics as controls, individuals who were recognized as socially or financially less privileged including race/ethnicity (Black), marital status (the separated/divorced/widowed), employment status (disabled, unemployed), and income (lowest group) had a greater likelihood of encountering higher financial fragility than their counterparts (White, married, full-time salary worker, higher income groups). Those who had more dependents to financially support or who had experienced a transitory income shock were also at greater risk for financial fragility. The results are consistent with previous studies indicating the vulnerability of the underrepresented in society. For example, those with stable employment status (e.g., employed full-time), higher income, greater wealth, and higher education were more likely to hold emergency funds, which is a conservative measurement of financial fragility, while racial/ethnic minorities, lower income and education levels, and unstable employment status have been negatively associated with emergency savings (Babiarz & Robb, 2014; Brobeck, 2008; Joo & Grable, 2006). Our findings may imply changing social dynamics in those groups.

Our measures of financial fragility suggested the vulnerable financial status of respondents in the time of financial shocks and uncertainty. However, we believe that addressing financial fragility may require greater social attention and intervention. For example, a focus on socioeconomic and environmental characteristics at various levels and their relationship to personal finance could be helpful (Claessens & Perotti, 2007; Killewald et al., 2017). Although the dynamics among the variables were not fully investigated in this study, the results suggest the concerns may be a combination of factors. Future studies can expand our discussion by analyzing social factors and potential interactions.

When people assess themselves, they often compare themselves with others around them who serve as a reference point for decisions and behaviors, thus helping them understand the accuracy and appropriateness of their thoughts, feelings, and behaviors is important (Lim & Lee, 2021). Financial knowledge, skills, and attitudes are likely influenced by neighborhood effects. Therefore, our findings with the neighborhood effect suggest which groups could be a focus for future research as well as offering practical interventions. Community-specific treatment and intervention for financial knowledge and financial fragility issues could target those socially or financially vulnerable groups. Also, the intervention can expand ways to establish and maintain positive feedback loops or to increase positive externalities that reinforce one another's financial capability. Examining the neighborhood effect identified in the literature (e.g., access to resources, quality of programs, and social interactions) that would change over time, for example, or the use of other instrument variables analyzed in different research designs (e.g., focus group interviews, experiments) could provide more insight into the topic and the importance of opportunities at both individual and community levels. Thus, more local or neighborhood factors can be identified and tested to improve the usefulness or validity of financial knowledge by future studies.

Further, as knowledge of how financial systems works has been seen as a critical ground for financial skills and behaviors (Hung et al., 2009), our findings confirm the importance of objective financial knowledge to mitigate financial fragility and which components of financial knowledge can be discussed for future research and suggest practical interventions. Financial knowledge components that were measured in this study reflect conceptual definitions, so our conclusions are restricted to those components. In designing and implementing educational and behavioral interventions, the knowledge-based approach should gain continued support from financial education, planning, and counseling programs. It may also be useful to consider specific knowledge domains in personal finance to improve its effect on financial behaviors and outcomes.

There are some limitations, and they provide important avenues for future research. First, this study empirically tested and validated the instrument for financial knowledge in assessing the role of financial knowledge on financial fragility. Future studies can extend our discussion by employing diversified instruments for other financial decisions and outcomes. Second, we excluded respondents who reported "prefer not to say" to the objective financial knowledge and reported "prefer not to say" or "don't know" to the perceived knowledge question. Given the limited literature on the validity of financial knowledge measures, future researchers might conduct exploratory analyses to assess the validity or degree of measurement errors of "don't know" or "refused to answer" responses as a financial knowledge measure. Further, this study used one cross-sectional dataset to explore the relationship between financial knowledge and financial fragility. The

use of a longitudinal dataset could allow researchers to conduct more advanced analyses, e.g., the timing at which households are financially fragile with a possible variation of financial knowledge by following the same respondents across survey years.

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