



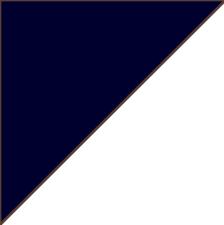
Financial Knowledge Disparities and Inequality of Opportunity

Namhoon Kim

Department of Food and Resource
Economics,
Pusan National University

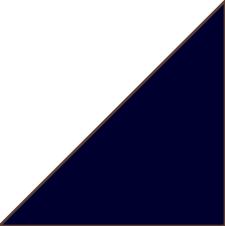
Travis P. Mountain

Department of Financial Planning,
Housing, and Consumer Economics,
University of Georgia



01

Introduction



01. Introduction

○ Background and Motivation

- Wealth inequality remains a major issue in the United States.
- Financial knowledge plays a key role in driving long-term wealth accumulation.
- Those with higher financial knowledge tend to make better financial decisions.
- If some individuals face barriers to acquiring financial knowledge, these barriers may make broader economic inequality.
- Identifying and removing these barriers is important—not just for individuals, but for society as a whole.

01. Introduction

○ Research Gap

- Financial literacy is necessary for financial well-being, however large disparities persist across gender and race.
- Women and racial minorities like nonwhite have consistently lower scores on financial knowledge even controlling for income and education.
- Most previous research focuses on describing the gaps, not explaining their origins.
- The role of inequality of opportunity (IOP) has received limited attention.
- If the gaps are structurally created, policy interventions against it.

01. Introduction

○ Purpose of this study

- Investigate whether inequality of opportunity affects financial knowledge among young adults.
- Focus on circumstance-based factors: gender, race, age, and financial education access.
- Identify which areas of financial knowledge are most affected by Inequality of opportunity.
- Provide evidence-based policy implications for reducing disparities in financial literacy.

02

Theoretical Framework

02. Inequality of Opportunity

○ What is Inequality of Opportunity (IOP)?

- IOP decomposes total inequality into:
 - Effort: individual responsibility
 - Luck: random events
 - Circumstance: factors beyond control (e.g., gender, race)
- Only effort-based inequality is considered ethically acceptable (Roemer, 1998).
- Circumstance-based inequality is unfair and demands policy attention.

02. Theoretical Framework

○ Ex-Ante vs. Ex-Post Inequality

- Ex-ante IOP:
 - Equality achieved if those exerting equal effort have equal outcomes.
- Ex-post IOP:
 - Evaluates outcomes directly, regardless of effort.
- This study estimates ex-ante IOP to capture effects of uncontrollable circumstances.
- Useful when effort and luck are unobservable.

02. Theoretical Framework

○ Empirical Detection of IOP

- If exogenous (circumstance) variables like gender or race significantly affect outcomes:
 - That is evidence of inequality of opportunity.
- Regression and Shapley decomposition can detect and quantify these effects.
- The goal: separate unfair inequality from justifiable differences due to effort.

02. Gender and Racial Gaps in Financial Knowledge

○ Gender Disparities in Financial Knowledge

- Women underperform men in financial literacy (Lusardi & Mitchell, 2008, 2011).
- Causes include:
 - Lower confidence in financial decisions (Lusardi & Tufano, 2015)
 - Less financial education in early life (Fonseca et al., 2012)
- Gaps exist in both objective scores and self-assessed knowledge (Bucher-Koenen et al., 2021).
- Implications: vulnerability in retirement planning and investment choices.

02. Gender and Racial Gaps in Financial Knowledge

○ Racial Disparities in Financial Knowledge

- Black and Hispanic individuals score lower than white counterparts (Hung et al., 2009; Lusardi, 2019).
- Causes include:
 - Limited access to credit markets
 - Lower intergenerational wealth
 - Unequal educational opportunities (Collins, 2015)
- Barriers to financial products and trustworthy advice limit learning-by-doing.

02. Hypotheses

○ Theoretical Basis for Hypotheses

- This study builds on the theory of inequality of opportunity (IOP).
- IOP suggests that outcomes should not be determined by circumstances beyond a person's control.
 - Examples: gender, race, family background
- These circumstances influence:
 - Access to financial education
 - Intergenerational knowledge transfer
- If disparities in financial knowledge stem from these factors, we can say "IOP exists."

02. Hypotheses

○ Hypothesis 1

H1: *Individuals in disadvantaged groups, including women and racial minorities, exhibit lower levels of financial knowledge than those in advantaged groups, after controlling for other factors such as education and income.*

- Reflects the idea that structural inequalities shape financial knowledge.
- Early-life disadvantage may limit learning, regardless of individual effort.
- This is a test of whether group differences persist after adjusting for effort-based variables.

02. Hypotheses

○ Hypothesis 2 and 3

H2: *A large portion of inequality in financial knowledge is due to circumstances, not effort.*

H3: *IOP is greater for women, racial minorities, and less-educated groups.*

H4: *The areas where inequality of opportunity appears are different for each disadvantaged group*

- These hypotheses test:
 - How much of financial knowledge inequality is unjustifiable (due to background)
 - Whether certain subgroups suffer more IOP than others by areas
- This reflects intersectionality in how disadvantage operates.

02. Hypotheses

○ Empirical Strategy

- Hypotheses are tested using:
 - Regression analysis to estimate outcome gaps
 - Shapley value decomposition to isolate the effect of each circumstance
- The model focuses on ex-ante IOP:
 - Determines whether outcomes differ despite equal effort
- Goal: Understand whether financial knowledge gaps reflect structural unfairness

03

Data and Method

03. Data and Measures

○ Data Source and Sample

- Data: 2021 National Financial Capability Study (NFCS)
- Total sample: 27,091 respondents
- Analytical sample: 7,705 young adults aged 18–34
 - Focus on early-stage financial knowledge development
- Justification: Young consumers are a critical population for examining inequality of opportunity in financial education.

03. Data and Measures

○ Dependent Variables (Financial Knowledge)

- Based on 6 core financial literacy questions:
 - Interest rates
 - Inflation
 - Bond prices
 - Compounding (doubling money)
 - Mortgage duration
 - Diversification (stock risk)
- Two types of outcome variables:
 - Binary (per question): 1 = correct, 0 = incorrect
 - Total score (0–6): number of correct answers

03. Data and Measures

○ Key Independent Variables (Sociodemographics)

- Gender: Male or Female
- Age group: 18–24 or 25–34
- Race: White or Non-white
- Education level:
 - High school or below
 - Some college (including associate degree)
 - College graduate or higher
- Household income:
 - High: > \$75K
 - Middle: \$35K – \$75K
 - Low: ≤ \$35K

03. Data and Measures

○ Key Independent Variables (Financial Education)

- Measured by formal financial education experience:
 - No exposure
 - Offered but not participated
 - Participated
 - * If participated → Asked where:
 - In high school
 - In college
 - From workplace
- Military-based education was excluded from this study.

03. Method

○ Overview of Analytical Framework

- Method follows Juárez & Soloaga (2014) for measuring Inequality of Opportunity (IOP).
- Main steps:
 - Run regression using gender and race as key exogenous variables.
 - Use predicted values to compute an inequality index.
 - Apply Shapley decomposition to quantify contribution of each factor.
- Regression model:

$$fin.knowledge = \beta_0 + x_i\beta_1 + \beta_2female + \beta_3nonwhite$$

03. Method

○ Measuring Inequality – Dissimilarity Index

- Inequality index θ_a computed using fitted values \hat{y} :

$$I(\hat{y}) = \frac{1}{N\bar{y}} \sum_{i=1}^N |y_i - \bar{y}|$$

- Source: Paes de Barros et al., 2007

- Or modified version:

$$I(\hat{y}) = \frac{2}{N\bar{y}} \sum_{i=1}^N |y_i - \bar{y}|$$

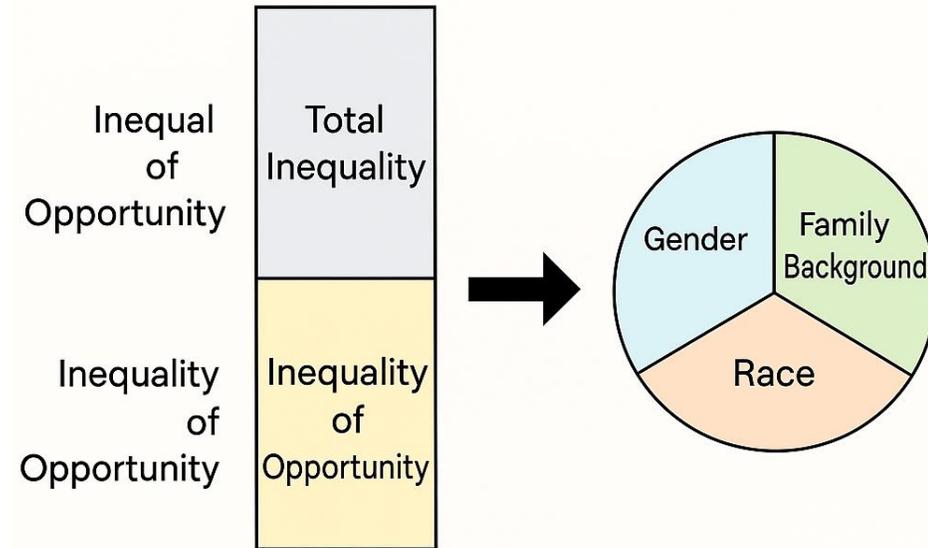
- Source: Soloaga et al., 2013
- \bar{y} : Sample mean
- Suitable for binary and ordered outcomes

03. Method

○ Shapley Value Decomposition

- Shapley value measures marginal contribution of each variable to inequality.
- Compares full model to all possible sub-models.
- Calculates average effect of adding each variable across all combinations.
- Applied here to decompose the role of:
 - Gender
 - Race
 - Other sociodemographic factors

03. Method



Shapley Value Decomposition

<Image by Chatgpt>

03. Method

	remove first	remove first	remove first	
	0.72	0.30	0.18	0.00
	0.72	0.30	0.12	0.00
	0.72	0.54	0.18	0.00
	0.72	0.54	0.24	0.00
	0.72	0.48	0.12	0.00
	0.72	0.48	0.24	0.00

<Frank Huettner and Marco Sunder (2012)>
 "Stata module for decomposing goodness of fit according to Shapley and Owen values" Presentation at the UK Stata Users Group meeting, London, 13/14 Sept. 2012

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon$$

log wage intelligence schooling experience

$$Sh(x_j) = \frac{1}{k!} \sum_{\text{all permutations}} \triangle MC$$

$$Sh(\text{graduation cap}) = \frac{1}{6} \cdot (0.12 + 0.12 + 0.18 + 0.18 + 0.12 + 0.24) = 0.16$$

$$Sh(\text{brain}) = \frac{1}{6} \cdot (0.42 + 0.42 + 0.36 + 0.24 + 0.36 + 0.24) = 0.34$$

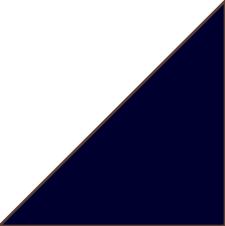
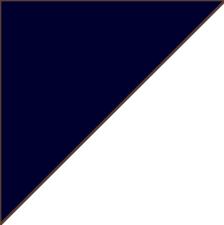
$$Sh(\text{shovel}) = \frac{1}{6} \cdot (0.18 + 0.18 + 0.18 + 0.30 + 0.24 + 0.24) = 0.22$$

$\Sigma = 0.72$

03. Method

○ Why Use the Shapley Value?

- Advantages over standard regression:
 - Fairly attributes inequality to variables regardless of entry order
 - Handles multicollinearity and interactions
 - More robust, interpretable decomposition of IOP
- Particularly useful in evaluating:
 - Gender and racial inequality
 - Role of background circumstances in shaping financial knowledge



04
Result

04. Result

○ Overview of Inequality of Opportunity (IOP)

- Analysis based on dissimilarity index and Shapley value decomposition
- Total inequality of opportunity in financial knowledge ranges from 0.035 to 0.362
- All estimates are statistically significant (bootstrapped standard errors)
- Focus: How much of IOP is attributable to gender, race, and financial education

04. Result

Variable	Cut points					
	1	2	3	4	5	6
Individual characteristics						
Gender	0.003 (9%)	0.009 (11.4%)	0.019 (13.2%)	0.041 (17.7%)	0.066 (20.3%)	0.09 (20.7%)
Race	0.003 (10%)	0.006 (7.3%)	0.009 (6.5%)	0.012 (5.4%)	0.014 (4.2%)	0.012 (2.8%)
Age	0 (0%)	0.018 (23.6%)	0.037 (25.5%)	0.047 (20.6%)	0.058 (17.7%)	0.083 (19.3%)
Family status	0.004 (11%)	0.006 (7.2%)	0.009 (6%)	0.013 (5.5%)	0.017 (5.2%)	0.021 (4.8%)
Education	0.008 (22.7%)	0.016 (20%)	0.03 (20.4%)	0.049 (21.5%)	0.072 (22%)	0.095 (22%)
Employment status	0.009 (25.8%)	0.019 (24.4%)	0.034 (23.2%)	0.054 (23.3%)	0.078 (24%)	0.101 (23.2%)
Financial education	0.007 (21.5%)	0.005 (6.1%)	0.008 (5.2%)	0.013 (5.9%)	0.021 (6.5%)	0.031 (7.2%)
Total	0.034 (100%)	0.078 (100%)	0.145 (100%)	0.229 (100%)	0.326 (100%)	0.433 (100%)

04. Result

○ Contribution of Gender, Race, and Education

- Gender accounts for 8.2%–20.2% of total IOP
 - Peak at cut-point 5: women account for 21.3% of total IOP
- Race contributes 2.5%–9.0% of IOP
- Financial education explains 9.3%–20.4%
 - Even though education isn't a fixed trait, policy-driven access makes it a key structural factor

04. Result

○ IOP by Financial Knowledge Question

- Decomposed IOP into six knowledge domains
- Gender-based IOP is largest in:
 - Q2 (Inflation): 24.3%
 - Q3 (Bond Price): 23.6%
 - Q6 (Stock Price): 23.3%
- Lowest in Q5 (Mortgage): 2.2%

04. Result

Variable	Question number					
	1	2	3	4	5	6
Individual characteristics						
Gender	0.010 (13.2%)	0.036 (24.3%)	0.031 (23.6%)	0.023 (21.9%)	0.002 (2.2%)	0.033 (23.3%)
Race	0.016 (20.9%)	0.015 (10.3%)	0.003 (2.5%)	0.001 (1.0%)	0.015 (14.5%)	0.004 (2.7%)
Age	0.010 (12.9%)	0.009 (5.9%)	0.001 (0.8%)	0.002 (2.1%)	0.016 (15.4%)	0.007 (5.1%)
Family status	0.006 (7.6%)	0.014 (9.1%)	0.006 (4.4%)	0.007 (6.8%)	0.013 (13.3%)	0.007 (5.1%)
Education	0.014 (18.7%)	0.035 (23.3%)	0.020 (14.9%)	0.020 (19.7%)	0.019 (19%)	0.043 (30.3%)
Employment status	0.012 (16.1%)	0.031 (20.4%)	0.040 (30.3%)	0.024 (23.2%)	0.025 (24.5%)	0.033 (23.1%)
Financial education	0.008 (10.6%)	0.01 (6.8%)	0.031 (23.5%)	0.026 (25.3%)	0.011 (11.1%)	0.015 (10.4%)
Total	0.074 (100%)	0.149 (100%)	0.132 (100%)	0.103 (100%)	0.101 (100%)	0.143 (100%)

04. Result

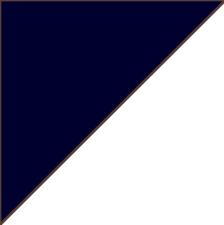
○ Racial and Age-based IOP Insights

- Race-based IOP is highest in:
 - Q1 (Interest): 20.9%
 - Q5 (Mortgage): 14.5%
- Lowest in:
 - Q3, Q4, Q6: Below 3%
- Age-based IOP: Younger participants less knowledgeable in Q1 and Q5

04. Result

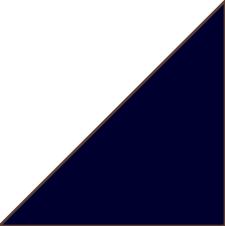
○ Impact of Financial Education

- Financial education significantly reduces IOP in:
 - Q3 (Bond Price)
 - Q4 (Compounding Interest)
- Absence of education in school/workplace → knowledge gaps
- Reinforces need for universal access to financial education programs



05

Discussion and Conclusion



05. Discussion

○ Key Findings – Inequality of Opportunity in Financial Knowledge

- The analysis confirms a persistent financial knowledge gap across individuals.
- Not all gaps stem from effort or education—gender and race, which are exogenous, explain a substantial portion.
- These disparities represent inequality of opportunity (IOP): gaps caused by characteristics beyond control variables.
- IOP matters because it reflects structural disadvantage, not individual failure.
- “IOP arises when people are systematically denied the chance to acquire financial knowledge because of who they are—not what they do.”

05. Discussion

○ Controlled but Persistent Gaps

- Even after controlling for:
 - Education
 - Employment
 - Formal financial education
- Substantial knowledge gaps still remain by gender and race.
- This implies structural inequalities are not fully explained by observable characteristics.
- “Inequality is not only about access to school, but about lived experience and systemic exposure gaps.”

05. Discussion

○ Gender Gaps by Type of Financial Knowledge

- Women show higher inequality of opportunity in:
 - Q2 (Inflation)
 - Q3 (Bond price)
 - Q6 (Stock price volatility)
- Lower inequality appears in:
 - Q5 (Mortgage-related knowledge)
- “Women face structural disadvantages when it comes to understanding financial concepts that involve markets, investments, and future value—areas often shaped by prior access and experience.”

05. Discussion

○ Gaps by Type of Financial Knowledge

- Women face barriers in applied financial knowledge—investment, risk, and long-term financial decision-making
- This reflects limited exposure to complex financial environments, possibly due to gender roles, lack of early financial socialization, or exclusion from financial conversations.
- Implication: Need interventions that target advanced financial topics such as investing, compounding, diversification for young women.

05. Discussion

○ Racial Inequality in Financial Knowledge

- Nonwhite respondents show inequality of opportunity especially in:
 - Q1 (Interest rates)
 - Q5 (Mortgage knowledge)
- These questions relate to:
 - Credit and loan markets
 - Homeownership and housing finance
- “These are not knowledge gaps, but show limited access and exclusion from financial systems.”

05. Discussion

○ **Racial Inequality in Financial Knowledge**

- Racial minorities—especially nonwhite young adults—are disproportionately excluded from credit markets and housing finance systems.
- These are not knowledge gaps, but reflect structural exclusion from experience:
 - Discriminatory loan practices
 - Distrust in financial institutions
- Implication: Provide fair access to financial tools, credit products, and lending markets.

05. Discussion

○ Implications for Policy and Research

- Educational interventions should:
 - Target specific gaps (e.g., investing for women, home finance for minorities)
 - From general literacy efforts to addressing access and experiential barriers
- Future research should examine:
 - Behavioral and experiential financial inequality
 - Longitudinal impacts of IOP on wealth accumulation

05. Discussion

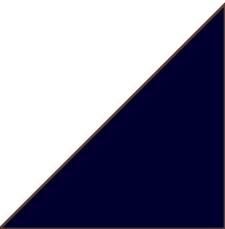
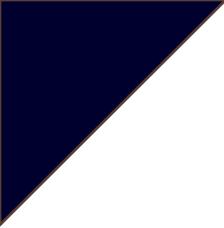
○ Implications for Policy and Research

- “Women (investment)” and “Nonwhite (Lending)”
- For women: Target investment literacy, with programs focused on confidence and experience in financial risk, returns, and markets.
- For nonwhite individuals: Address structural barriers to credit and improve access to financial education in lending, mortgages, and household finance.

05. Conclusion

○ Toward Equity in Financial Capability

- It is hard to say whether barriers lead to low financial knowledge, or if low financial knowledge leads to more barriers.
- However, one thing is clear: inequality of opportunity exists.
- That's why we need to create better access to financial education and real financial experiences, especially for those who have been left out.



Questions?