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# RETIREMENT WEALTH ADEQUACY ACCORDING TO BENCHMARKS

Yoon-Kyung Yuh

***Abstract:*** Based on two representative benchmarks, permanent income (*PI*) and permanent consumption (*PC*), this study examines the adequacy of retirement wealth among pre-retirees who are currently employed. It compares the determinants of retirement wealth adequacy according to two benchmarks under various definitions of retirement wealth: broad, intermediate, and narrow wealth. Analysis using the Survey of Consumer Finances shows significant differences in the proportion of pre-retirees with adequate wealth according to benchmarks and wealth definitions. The important determinants of retirement wealth adequacy are fairly consistent regardless of the benchmarks and wealth definitions. The crucial determinants include planned retirement age, subjective risk tolerance, and ownership of defined-benefit plans and non-financial assets.

retirement wealth adequacy; housing wealth, permanent income; lognormal forecasting model

**:** D31, J26, H31

## I. INTRODUCTION

Financial planning for retirement has become a major concern for many Americans in recent years given the rapidly aging working population and the expectation of financial insolvency in Social Security. Typically, pre-retirees wonder whether they will have enough money to live comfortably after retirement. That is, having enough wealth for retirement has been one of the most important issues in an aging society, and thus evidence on retirement wealth adequacy is of particular interest given this economic and policy environment.

There is no universally accepted definition of wealth adequacy. Moreover, evaluating the adequacy of wealth accumulation is difficult since it requires a standard or a benchmark against which observed behavior can be measured. In previous studies, the adequacy of retirement wealth is analyzed in relation to an absolute or a relative benchmark. The absolute benchmark generally refers to a poverty threshold.[1] Although the poverty threshold is a standard measure that is widely used in public policy, it is a limited and is an arbitrary benchmark of wealth adequacy or optimality of savings (Love *et al*

* School of Business, Ewha Womens University 52, Ewhayeodae-Gil, Seodaenun-Seodaemun-Gu, Seoul 120-750, Korea, *E-mail: yuhyk@ewha.ac.kr; yuhyk17@gmail.com*

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## II. REVIEW OF THE LITERATURE

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*et al*

## III. EMPIRICAL MODEL

### 3.1. Simple Life Cycle Model

$n$ $C_n$ $n+$ $C_{n+1}$) to maximize lifetime utility under certain conditions is derived as

$$\frac{C_{n+1}}{C_n} = \frac{1+r}{1+\rho}^{-\frac{1}{\varepsilon}} \quad (1)$$

This equation shows that the future consumption increment depends on real return ( $\rho$ $\varepsilon$

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[3] Therefore, this study develops an extended form of the replacement ratio approach to evaluate the adequacy of retirement wealth. From a theoretical economic perspective, the replacement ratio approach is less appealing than a life cycle-dynamic programming approach, as it ignores the utility theory and behavioral responses to uncertainty. However, the replacement ratio is a measure that is more robust and less subjected to distortion by the differences in modeling approaches (Valdez and Chernih, 2003). It is also a popular model among retirement planning practitioners and can be seen as a relatively tractable approximation to the life cycle model (Moore and Mitchell, 1997, 2000).

One key issue in the replacement ratio is how the pre-retirement income used in the denominator should be defined.[4] To estimate the replacement ratio for each household, the current study adopts two types of measures for pre-retirement income: permanent income (

$$POI_i = \frac{n_{po}}{n_{pr}} \times PRI_i$$

*po*

*pr*

$$PRR_i = \frac{A_R}{PRI_i}$$

$$BRR_i = \frac{POI_i}{PRI_i}$$

$$A_R = \frac{TRW}{PVIFA \cdot (1+r)}$$

$$FS = \sum_{j=1}^{n} Aj \cdot FVAD_{I_j}$$

#### *4.1.1. Defined Benefit Wealth (DBW) and Defined Contribution Wealth (DCW)*

### *4.1.2. Social Security Wealth (SSW)*

### *4.1.3. Financial Wealth (FW) and Non-financial Wealth (NFW)*

$$I_j = \exp(m_j + Z \cdot s_j / \sqrt{n}) - 1$$

*PI* *PC*

**Table 1**
**Households with Adequate Retirement Wealth According to Benchmarks and Wealth Definitions**

| | *Benchmark* | | *Test for difference* | |
|---|---|---|---|---|
| | *PI* | *PC* | *t-value* | *Sig.* |
| Broad wealth | 55.71 | 63.85 | -29.68 | <0.0001 |
| Intermediate wealth | 49.39 | 56.93 | -28.49 | <0.0001 |
| Narrow wealth | 41.76 | 49.54 | -28.98 | <0.0001 |

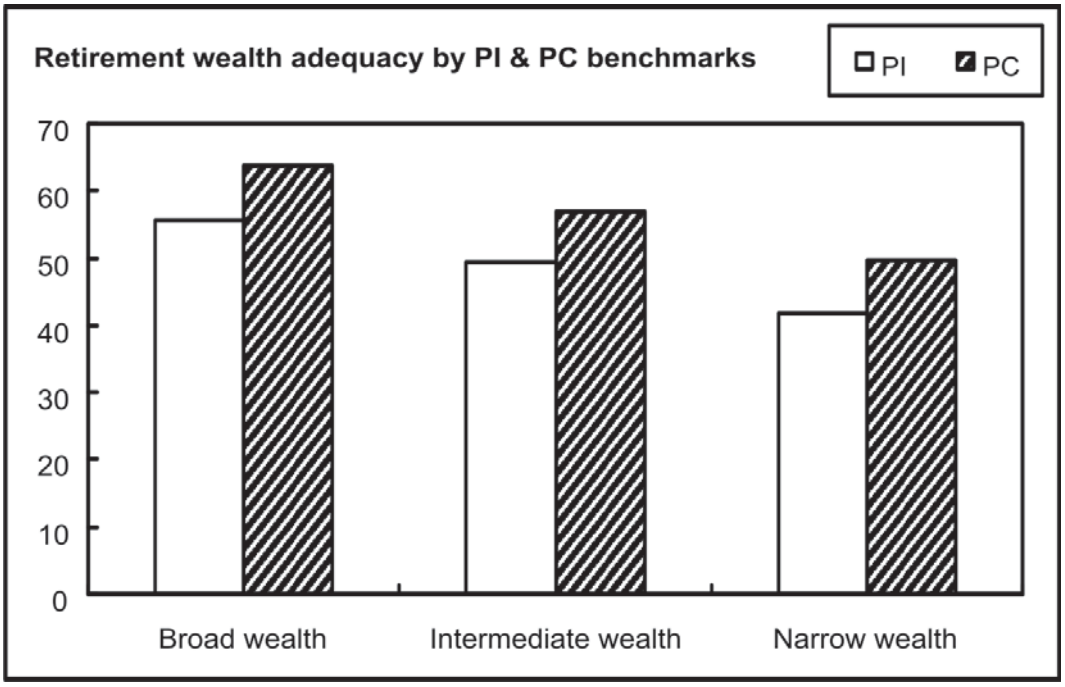


**Figure 1: Retirement Wealth Adequacy According to Benchmarks and Wealth Definitions**

**Table 2**
**Three Adequacy Groups According to Wealth Definitions**

| | *Adequacy groups according to PI and PC benchmarks* | | |
|---|---|---|---|
| | *A: consistent adequacy PI: adequate, PC:adequate* | *B: inconsistent adequacy PI: inadequate, PC: adequate* | *C: consistent inadequacy PI: inadequate, PC: inadequate* |
| Broad wealth | 55.71 | 8.13 | 36.15 |
| Intermediate wealth | 49.39 | 7.54 | 43.07 |
| Narrow wealth | 41.76 | 7.78 | 50.46 |

*Notes:* No observation of "adequate" for PI benchmark and "inadequate" for PC benchmark.

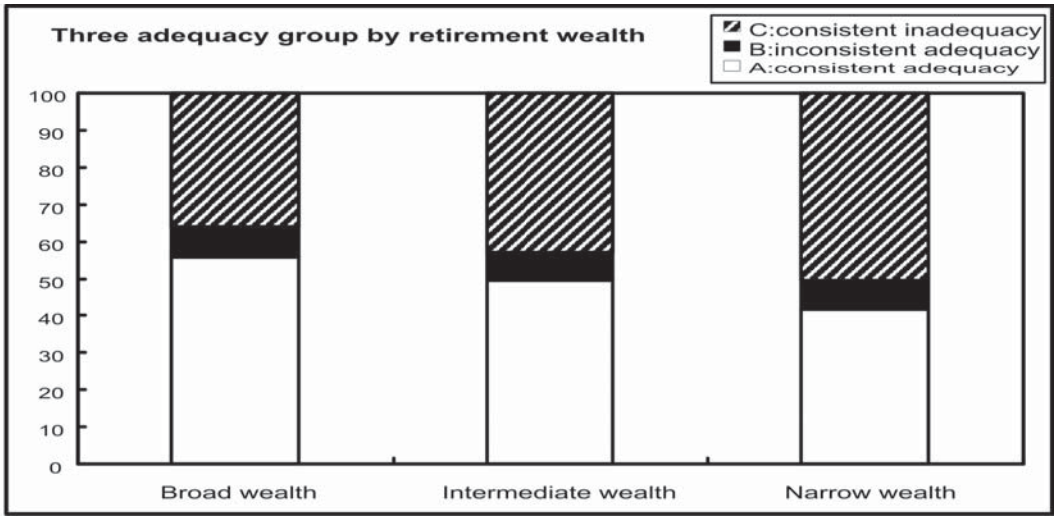


**Figure 2: Three Adequacy Groups According to Wealth Definitions**

**Table 3**
**Summary of Adequacy Measures According to Three Adequacy Groups**

| *Adequacy measures* | *Total (n = 1,991) mean* | *Adequacy group* *A: consistent adequacy PI:adequate, PC:adequate* | *B: inconsistent adequacy PI:inadequate, PC:adequate* | *C: consistent inadequacy PI:inadequate, PC:inadequate* | *Pr>F* |
|---|---|---|---|---|---|
| | | *Broad wealth* | | | |
| | | *n=1,251* | *n=107* | *n=633* | |
| DBW (defined-benefit wealth) | 134,785 | 209,486 | 59,771 | 36,546 | 0.0003 |
| DCW (defined-contribution wealth) | 220,369 | 321,568 | 132,535 | 84,180 | <0.0001 |
| SSW (Social Security wealth) | 372,656 | 365,904 | 381,607 | 381,047 | 0.0470 |
| FW (financial wealth) | 271,270 | 396,107 | 112,724 | 114,563 | <0.0001 |
| NFW (non-financial wealth) | 1,046,968 | 1,651,073 | 255,125 | 294,177 | <0.0001 |
| TRW (total retirement wealth) | 2,046,048 | 2,944,139 | 941,762 | 910,513 | <0.0001 |
| AR (annualized retirement wealth) | 150,320 | 223,038 | 61,394 | 58,266 | <0.0001 |
| PRR1 (replacement ratio using PI) | 1.37 (0.83) | 1.98 | 0.78 | 0.55 | <0.0001 |
| PRR2 (replacement ratio using PC) | 1.57 (0.94) | 2.28 | 0.93 | 0.61 | 0.0001 |
| PRI1 (pre-retirement PI) | 102,031 | 99,525 | 80,005 | 110,846 | <0.0001 |
| PRI2 (pre-retirement PC) | 92,621 | 90,792 | 67,835 | 101,016 | <0.0001 |
| | | Intermediate wealth | | | |
| | | n=1,157 | n=105 | n=729 | |
| DBW (defined-benefit wealth) | 134,785 | 229,362 | 66,124 | 38,352 | <0.0001 |
| DCW (defined-contribution wealth) | 220,369 | 346,678 | 165,906 | 85,059 | <0.0001 |
| SSW (Social Security wealth) | 372,656 | 363,271 | 385,014 | 381,254 | 0.0669 |
| FW (financial wealth) | 271,270 | 432,489 | 101,832 | 116,061 | <0.0001 |
| NFW (non-financial wealth) | 929,418 | 1,667,549 | 200,153 | 210,660 | <0.0001 |
| TRW (total retirement wealth) | 1,928,498 | 3,039,350 | 919,030 | 831,387 | <0.0001 |
| AR (annualized retirement wealth) | 142,227 | 232,031 | 60,589 | 53,539 | <0.0001 |
| PRR1 (replacement ratio using PI) | 1.28 (0.76) | 2.00 | 0.77 | 0.53 | <0.0001 |
| PRR2 (replacement ratio using PC) | 1.46 (0.85) | 2.31 | 0.92 | 0.59 | <0.0001 |
| PRI1 (pre-retirement PI) | 102,031 | 101,164 | 78,662 | 107,116 | <0.0001 |
| PRI2 (pre-retirement PC) | 92,621 | 92,417 | 66,627 | 97,408 | <0.0001 |
| | | Narrow wealth | | | |
| | | n=1,041 | n=105 | n=845 | |
| DBW (defined-benefit wealth) | 134,785 | 263,875 | 63,803 | 38,893 | <0.0001 |
| DCW (defined-contribution wealth) | 220,369 | 378,873 | 210,326 | 90,733 | <0.0001 |
| SSW (Social Security wealth) | 372,656 | 361,847 | 375,243 | 381,203 | 0.1101 |
| FW (financial wealth) | 271,270 | 485,671 | 107,456 | 119,091 | <0.0001 |
| NFW (non-financial wealth) | 811,868 | 1,783,119 | 96,808 | 118,313 | <0.0001 |
| TRW (total retirement wealth) | 1,810,949 | 3,273,386 | 853,635 | 748,232 | <0.0001 |
| AR (annualized retirement wealth) | 134,135 | 252,347 | 55,679 | 48,398 | <0.0001 |
| PRR1 (replacement ratio using PI) | 1.19 (0.68) | 2.11 | 0.74 | 0.50 | <0.0001 |
| PRR2 (replacement ratio using PC) | 1.36 (0.76) | 2.43 | 0.87 | 0.55 | <0.0001 |
| PRI1 (pre-retirement PI) | 102,031 | 104,058 | 75,659 | 104,420 | <0.0001 |
| PRI2 (pre-retirement PC) | 92,621 | 95,190 | 64,979 | 94,759 | <0.0001 |

*Notes:* median in parenthesis

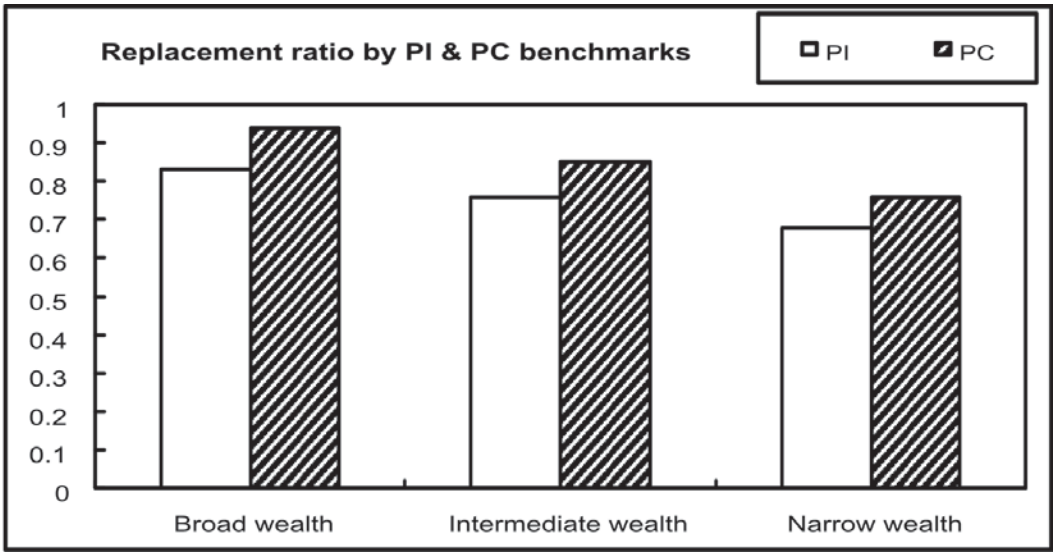


**Figure 3: Replacement Ratio According to Benchmarks and Wealth Definitions**

*Notes:* Figure is based on the median replacement ratio

**Table 4**
**Characteristics of the Three Adequacy Groups**

| *Characteristics* | *Total (n=1,991) mean* | *Adequacy group A: consistent adequacy PI:adequate, PC:adequate* | *B: inconsistent adequacy PI:inadequate, PC:adequate* | *C: consistent inadequacy PI:inadequate, PC:inadequate* | *Pr>F or Pr>Chi-square* |
|---|---|---|---|---|---|
| | Broad wealth | | | | |
| | | n=1,251 | n=107 | n=633 | |
| Age (years) | 50.28 | 49.84 | 50.51 | 50.92 | 0.1130 |
| Planned retirement age (years) | 64.12 | 65.12 | 63.46 | 62.73 | <0.0001 |
| Anticipated life expectancy(years) | 31.71 | 32.51 | 31.48 | 30.52 | <0.0001 |
| Couple(%) | 69.00 | 69.96 | 69.66 | 67.38 | 0.0305 |
| Single(%) | 31.00 | 30.04 | 30.34 | 32.62 | |
| White(%) | 76.36 | 76.89 | 77.18 | 75.35 | 0.2044 |
| Non-white(%) | 23.64 | 23.11 | 22.82 | 24.65 | |
| College education(%) | 63.65 | 63.59 | 60.69 | 64.42 | 0.1359 |
| ≤ High school(%) | 36.35 | 36.41 | 39.31 | 35.58 | |
| Good health(%) | 85.11 | 86.76 | 86.57 | 82.23 | <0.0001 |
| Fair or poor health(%) | 14.89 | 13.24 | 13.43 | 17.77 | |
| Expect inheritance(%) | 15.24 | 16.10 | 9.96 | 15.10 | <0.0001 |
| Not expect inheritance(%) | 84.76 | 83.90 | 90.04 | 84.90 | |
| Spend≥income(%) | 35.06 | 35.10 | 32.89 | 35.50 | 0.3712 |
| Spend<income(%) | 64.94 | 64.90 | 67.11 | 64.50 | |
| High risk taking(%) | 23.87 | 25.68 | 27.01 | 20.38 | <0.0001 |
| Not taking a high risk(%) | 76.13 | 74.32 | 72.99 | 79.62 | |
| Have a DB pension(%) | 25.88 | 29.10 | 31.82 | 19.59 | <0.0001 |
| Not have a DB pension(%) | 74.12 | 70.90 | 68.18 | 80.41 | |
| Have a DC pension(%) | 24.61 | 22.13 | 28.18 | 27.63 | <0.0001 |
| Not have a DC pension(%) | 75.39 | 77.87 | 71.82 | 72.37 | |
| Have non-financial assets(%) | 35.09 | 42.96 | 31.50 | 23.77 | <0.0001 |
| Not have non-financial assets(%) | 64.91 | 57.04 | 68.50 | 76.23 | |

*contd. table 4*

| | | | | | |
|---|---|---|---|---|---|
| Intermediate wealth | | | | | |
| | | n=1,157 | n=105 | n=729 | |
| Age (years) | 50.28 | 49.87 | 50.63 | 50.69 | 0.6701 |
| Planned retirement age (years) | 64.12 | 65.27 | 63.58 | 62.90 | <0.0001 |
| Anticipated life expectancy(years) | 31.71 | 32.75 | 30.98 | 30.63 | <0.0001 |
| Couple(%) | 69.00 | 69.82 | 70.07 | 67.87 | 0.1061 |
| Single(%) | 31.00 | 30.18 | 29.93 | 32.13 | |
| White(%) | 76.36 | 76.82 | 77.66 | 75.60 | 0.2644 |
| Non-white(%) | 23.64 | 23.18 | 22.34 | 24.40 | |
| College education(%) | 63.65 | 62.57 | 64.45 | 64.75 | 0.0866 |
| ≤ High school(%) | 36.35 | 37.43 | 35.55 | 35.25 | |
| Good health(%) | 85.11 | 86.15 | 87.70 | 83.46 | 0.0002 |
| Fair or poor health(%) | 14.89 | 13.85 | 12.30 | 16.54 | |
| Expect inheritance(%) | 15.24 | 15.63 | 15.34 | 14.77 | 0.5114 |
| Not expect inheritance(%) | 84.76 | 84.37 | 84.66 | 85.23 | |
| Spend≥income(%) | 35.06 | 34.24 | 37.17 | 35.64 | 0.1702 |
| Spend<income(%) | 64.94 | 65.76 | 62.83 | 64.36 | |
| High risk taking(%) | 23.87 | 26.10 | 23.87 | 21.32 | <0.0001 |
| Not taking a high risk(%) | 76.13 | 73.90 | 76.13 | 78.68 | |
| Have a DB pension(%) | 25.88 | 29.18 | 33.26 | 20.81 | <0.0001 |
| Not have a DB pension(%) | 74.12 | 70.82 | 66.74 | 79.19 | |
| Have a DC pension(%) | 24.61 | 21.91 | 25.70 | 27.51 | <0.0001 |
| Not have a DC pension(%) | 75.39 | 78.09 | 74.30 | 72.49 | |
| Have non-financial assets(%) | 35.09 | 45.17 | 32.05 | 24.06 | <0.0001 |
| Not have non-financial assets(%) | 64.91 | 54.83 | 67.95 | 75.94 | |
| Narrow wealth | | | | | |
| | | n=1,041 | n=105 | n=845 | |
| Age (years) | 50.28 | 49.71 | 50.50 | 50.72 | 0.1293 |
| Planned retirement age (years) | 64.12 | 65.53 | 63.73 | 63.02 | <0.0001 |
| Anticipated life expectancy(years) | 31.71 | 33.03 | 31.61 | 30.63 | <0.0001 |
| Couple(%) | 69.00 | 69.80 | 70.73 | 68.07 | 0.1122 |
| Single(%) | 31.00 | 30.20 | 29.27 | 31.93 | |
| White(%) | 76.36 | 76.39 | 78.80 | 75.96 | 0.2227 |
| Non-white(%) | 23.64 | 23.61 | 21.20 | 24.04 | |
| College education(%) | 63.65 | 62.81 | 63.49 | 64.38 | 0.2967 |
| ≥ High school(%) | 36.35 | 37.19 | 36.51 | 35.62 | |
| Good health(%) | 85.11 | 86.37 | 87.07 | 83.76 | 0.0006 |
| Fair or poor health(%) | 14.89 | 13.63 | 12.93 | 16.24 | |
| Expect inheritance(%) | 15.24 | 15.09 | 18.89 | 14.79 | 0.0120 |
| Not expect inheritance(%) | 84.76 | 84.91 | 81.11 | 85.21 | |
| Spend≥income(%) | 35.06 | 34.43 | 35.03 | 35.60 | 0.5063 |
| Spend<income(%) | 64.94 | 65.57 | 64.97 | 64.40 | |
| High risk taking(%) | 23.87 | 26.75 | 24.84 | 21.34 | <0.0001 |
| Not taking a high risk(%) | 76.13 | 73.25 | 75.16 | 78.66 | |
| Have a DB pension(%) | 25.88 | 31.55 | 24.49 | 21.41 | <0.0001 |
| Not have a DB pension(%) | 74.12 | 68.45 | 75.51 | 78.59 | |
| Have a DC pension(%) | 24.61 | 20.77 | 30.89 | 26.81 | <0.0001 |
| Not have a DC pension(%) | 75.39 | 79.23 | 69.11 | 73.19 | |
| Have non-financial assets(%) | 35.09 | 49.39 | 30.88 | 23.90 | <0.0001 |
| Not have non-financial assets(%) | 64.91 | 50.61 | 69.12 | 76.10 | |

Table 5
**Logistic Analyses of Retirement Wealth Adequacy According to PI and PC Benchmarks**

| | *Broad Wealth* | | | | *Intermediate Wealth* | | | | *Narrow Wealth* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *PI* | | *PC* | | *PI* | | *PC* | | *PI* | | *PC* | |
| *Variable* | *Coeff.* | *Sig.* | *Coeff.* | *Sig.* | *Coeff.* | *Sig.* | *Coeff.* | *Sig.* | *Coeff.* | *Sig.* | *Coeff.* | *Sig.* |
| intercept | -6.2654 | <0.0001 | -5.8610 | <0.0001 | -6.4976 | <0.0001 | -6.0539 | <0.0001 | -7.2723 | <0.0001 | -6.6154 | <0.0001 |
| age | -0.0496 | <0.0001 | -0.0489 | <0.0001 | -0.0469 | <0.0001 | -0.0454 | <0.0001 | -0.0563 | <0.0001 | -0.0541 | <0.0001 |
| retirement age | 0.1253 | <0.0001 | 0.1229 | <0.0001 | 0.1236 | <0.0001 | 0.1198 | <0.0001 | 0.1356 | <0.0001 | 0.1290 | <0.0001 |
| anticipated life exp. | 0.0062 | 0.2350 | 0.0074 | 0.1656 | 0.0093 | 0.0730 | 0.0081 | 0.1210 | 0.0105 | 0.0466 | 0.0096 | 0.0665 |
| couple | 0.0783 | 0.5240 | 0.0708 | 0.5716 | 0.0404 | 0.7418 | 0.0323 | 0.7928 | -0.0258 | 0.8379 | 0.0033 | 0.9789 |
| black | -0.3183 | 0.1036 | -0.3337 | 0.0869 | -0.3184 | 0.1091 | -0.3324 | 0.0881 | -0.1862 | 0.3681 | -0.1654 | 0.4059 |
| hispanic | 0.5761 | 0.0127 | 0.6593 | 0.0073 | 0.5684 | 0.0117 | 0.6206 | 0.0079 | 0.4983 | 0.0272 | 0.5002 | 0.0269 |
| asian & other | 0.2778 | 0.2694 | 0.2814 | 0.2779 | 0.3348 | 0.1777 | 0.2967 | 0.2386 | 0.3185 | 0.2024 | 0.1376 | 0.5763 |
| college | 0.0313 | 0.8000 | -0.0755 | 0.5517 | -0.0349 | 0.7765 | -0.0808 | 0.5144 | 0.0104 | 0.9341 | -0.0520 | 0.6745 |
| good health | 0.1647 | 0.3113 | 0.2351 | 0.1521 | 0.0398 | 0.8071 | 0.1287 | 0.4287 | 0.0278 | 0.8684 | 0.0692 | 0.6730 |
| expect inheritance | 0.0855 | 0.5309 | -0.0384 | 0.7828 | 0.0110 | 0.9343 | -0.0125 | 0.9267 | -0.0574 | 0.6708 | -0.0466 | 0.7291 |
| spend≥income | 0.0285 | 0.8116 | 0.0446 | 0.7154 | -0.0480 | 0.6853 | 0.0393 | 0.7426 | -0.0076 | 0.9500 | 0.0488 | 0.6834 |
| high risk taking | 0.2710 | 0.0186 | 0.2814 | 0.0180 | 0.3244 | 0.0042 | 0.2850 | 0.0134 | 0.3395 | 0.0027 | 0.3136 | 0.0057 |
| have a DB plan | 0.5882 | <0.0001 | 0.7267 | <0.0001 | 0.5028 | 0.0001 | 0.6398 | <0.0001 | 0.6543 | <0.0001 | 0.6649 | <0.0001 |
| have a DC plan | -0.1677 | 0.1642 | -0.0750 | 0.5433 | -0.1241 | 0.3013 | -0.1103 | 0.3608 | -0.1950 | 0.1108 | -0.0553 | 0.6473 |
| have non-financial assets | 1.2929 | <0.0001 | 1.1802 | <0.0001 | 1.4388 | <0.0001 | 1.3302 | <0.0001 | 1.7414 | <0.0001 | 1.5543 | <0.0001 |
| chi-square | 340.6692 | <0.0001 | 294.1350 | <0.0001 | 379.7280 | <0.0001 | 329.5695 | <0.0001 | 473.0694 | <0.0001 | 400.4206 | <0.0001 |
| concordance | 73.6 | | 72.8 | | 74.5 | | 73.3 | | 76.9 | | 75.0 | |

*Notes:* Bold is significant at $p < 0.05$ or less.

## Notes

1. A multiple poverty threshold such as twice the poverty threshold has been used in several studies (Love *et al* *et al*

*et al*

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*et al*

$m_j, s_j, I_j$

Those in age 40 to 70 are more likely to have stable occupations and labor income, and have 'comfortable retirement' as one of their financial goals. Additionally, while most previous studies related to this topic focused 'older generation' than the sample of this study, this study extended to include this mid-aged group the previous study excluded. Several studies related to this topic also included this mid-age group (e.g., Wolff, 2006, aged 47-64; Engen, Gale, & Uccello, 2005, aged 25-62; Yuh, Montalto, & Hanna, 1998, aged 35-70).

8. A summary of sample characteristics is presented in Appendix Table 2.

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## Appendix

**Table 1**
***Projected Rates of Return by Lognormal Forecasting Model***

| *Asset category* | $m_j$ | $s_j$ | $I_j$ |
|---|---|---|---|

*Note:* $I_j$ $^{th}$ percentile of each asset based on data from Ibbotson Associates (2005)

**Table 2**
**Summary of Sample Characteristics (n = 1,991, 2004 SCF)**

| *Variable* | *n* | *%* |
|---|---|---|

≥

≥

≥