A Dynamic Analysis of the Impact of Household Portfolio Allocation Decisions on the Demand for Life Insurance

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Abstract

Prior research on the demand for life insurance in household portfolio holdings has not made a clear distinction between portfolio shifts resulting from active allocation decisions and those resulting from passive acceptance. Our study examines the relationship between household portfolio allocation decisions and the demand for life insurance in a dynamic setting, using panel data before and after the 2008 financial crisis. The study provides the first evidence that household decisions to invest in cash and cash equivalents, bonds, retirement assets, and pay off debts significantly affect life insurance ownership.

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Introduction

Household financial decisions are complex and interdependent, and central to the functioning of the financial system; however, an important asset class for households that has received comparatively less attention is life insurance (Gomes et al., 2021). Life insurance can provide households with financial protection and help them pay off debts in the event of the premature death of a wage earner. Whole life insurance, in particular, allows households to borrow against its cash value through a loan option. If households reduce or drop life insurance coverage during an economic downturn, they may experience financial hardships that can have significant economic consequences (Scott & Gilliam, 2014). Household financial decisions should be assessed and analyzed within the broader context of the entire portfolio, rather than focusing on individual assets, securities, or accounts (Rabbani et al., 2017; Gomes et al., 2021). During a recession, because of rising unemployment and declining income, households have a tight budget for various financial assets including stocks, bonds, and life insurance, and are less likely to pay off debts. The holdings of life insurance can be associated with the holdings of other financial assets and debts as households rebalance and adjust their financial portfolios. The allocation of household financial portfolios is essential in explaining the purchase of life insurance (Lin & Grace, 2007; Shi et al., 2015). Accordingly, it is

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crucial to explore household choices of life insurance within the framework of household portfolios.

Previous studies have addressed the importance of considering household portfolio holdings when analyzing the determinants of the demand for life insurance. Fortune (1973) indicates that life insurance is a substitute for primary financial assets. In contrast, Outreville (2013) suggests a positive relationship between the demand for life insurance and household holdings of primary financial assets. Luciano et al. (2016) explain this relationship by the increased participation in both the stock market and life insurance market due to financial market proximity and familiarity. Lin and Grace (2007) find that individual retirement accounts are complements to total life insurance for young- and middle-aged households. In addition to the holdings of financial assets, prior research has suggested that debt holdings can impact the demand for life insurance (Ferber & Lee, 1980). While Lin and Grace (2007) note that the effect of debts on life insurance could be ambiguous, Hau (2000) documents a positive effect, implying that life insurance benefits can serve as immediate cash to pay debts and costs of death.

More recently, Wang (2023) finds that changes in household portfolio holdings were more significant than life events in determining life insurance ownership. Changes in household portfolio holdings may result from the passive acceptance of portfolio shifts or from active decision-making for portfolio allocation and rebalancing (Bricker et al, 2011). Passive acceptance refers to situations where households simply accept portfolio shifts driven by external factors, such as changes in asset prices. This could result in household portfolios that may not necessarily align with their risk and return preferences. On the other hand, portfolio allocation involves households actively making decisions to rebalance the distribution of diverse financial assets within their portfolios to fulfill their financial needs. This process involves the consideration of factors such as financial objectives, risk tolerance, and financial literacy or guidance.

Under standard models of portfolio choices, households in efficient markets are expected to invest passively with a low frequency of portfolio rebalancing (Gomes et al., 2021). Nevertheless, Campbell et al. (2009) demonstrate that households trade more frequently and excessively than is good for their financial well-being. During the 2008 financial crisis, Bricker et al. (2011) indicate that the majority of families passively accepted changes in portfolio shares. Hoopes et al. (2016) demonstrate that households in the very highest income groups rebalanced financial portfolios more actively than others throughout the 2008 financial crisis. In response to business cycles, active portfolio allocation enables households to adjust their financial strategies as circumstances evolve. This guarantees that household portfolios stay aligned with their evolving needs. Consequently, it becomes important to differentiate between choices of active portfolio allocation and passive acceptance. However, this distinction has not been addressed within the existing body of insurance literature.

We aim to address this significant gap in the literature by investigating the relationship between active decision-making for household portfolio allocation and the demand for life insurance. To the best of our knowledge, our study is the first to explore this correlation. Using data from the Survey of Consumer Finances (SCF), we examine different portfolio allocation decisions that can have an impact on life insurance ownership and coverage. This unique focus provides valuable implications for financial advisors, policymakers, and households to enhance their overall financial planning strategies. Active engagement in portfolio allocation is expected to empower households with better-informed financial decisions, insights into diverse investment opportunities, and a deeper comprehension of overall household financial planning.

Additionally, our study contributes to the existing literature by highlighting a distinction of life insurance demand based on type. We distinguish between term life insurance, primarily designed as a pure safeguard against potential future income loss, and whole life insurance, which provides an additional vehicle for investment and

tax-efficient asset accumulation. Notably, prior research has emphasized the importance of treating the purpose and features of term life insurance differently from those of whole life insurance (Lin & Grace, 2007; Grable, 2016; Heo et al., 2021).

Moreover, our study makes a valuable contribution to the existing literature by utilizing panel data to explore the dynamics of life insurance demand. Liebenberg et al. (2012) suggest that a dynamic analysis based on panel data may provide the basis for a better understanding of the determinants for life insurance demand. Using the 2007-2009 SCF panel data, our paper investigates the impact of changes in household portfolio allocation decisions on life insurance ownership and coverage decisions in a dynamic setting. Specifically, life insurance ownership decisions examined in this paper include initiating, increasing, decreasing, and dropping life insurance holdings, and the dollar amount of these changes are included in life insurance coverage decisions (also see Liebenberg et al., 2012; Wang, 2023). Household portfolio allocation decisions include the decisions of debt repayment and investment in cash and cash equivalents, bonds, stock, and retirement assets. We apply a two-part Cragg model with Probit and Truncated regressions to identify the variables that significantly impact life insurance ownership and coverage decisions.

Lastly, our analysis is based on the context of the 2008 financial crisis period, which provides valuable insights into household portfolio decision-making in response to business cycles. Bricker et al. (2011) report that during the financial crisis, the ownership and median value of bonds and life insurance increased, while stocks experienced sharp declines in median value. The life insurance markets were more severely impacted by the financial crisis as they had relatively larger asset portfolios than other insurance markets (Baranoff & Sager, 2011). Our results indicate that, during the financial crisis, the ownership of term life insurance serves as a replacement for investments in cash and cash equivalents yet complements investments in bonds. Our results also indicate that term (whole) life insurance ownership is likely to be a complement (substitute) rather than a substitute (complement) for investment in retirement assets. We also find that households that pay off debts are more likely to initiate or increase whole life insurance ownership. These findings can provide valuable insights for financial planning practitioners, life insurance agents, and social policymakers, by guiding them to deliver adaptive and comprehensive financial services to households. Particularly relevant during economics downtowns, these insights can assist households that are adjusting their decisions of portfolio allocation to align with changing situations.

The remainder of the article is organized as follows. Section 2 provides a further literature review of the demand for life insurance. Section 3 outlines the methodology used to examine the impact of household portfolio allocation decisions on life insurance demand in the 2008 financial crisis, using panel data. Section 4 presents summary statistics of the data and empirical results. Finally, Section 5 concludes the study and discusses further implications for financial practitioners and agents.

Literature Review

Prior research has examined how household demographic characteristics and economic status influence the demand for life insurance (Ferber & Lee, 1980; Miller, 1985; Bernheim, 1991; Lin & Grace, 2007; Inkmann & Michaelides, 2012; Luciano et al., 2016; Wang, 2019). The results of these studies have been mixed in terms of financial assets, wealth, and retirement, as noted by Hau (2000), Zietz (2003), and Outreville (2014). Grable (2016) and Heo and Grable (2017) suggest that if a financial planner leans only on the functional characteristics of life insurance purchases, the consumer's needs may ultimately not be fulfilled. Meanwhile, Heo (2020) and Heo et al. (2021) examine the factors related to life insurance ownership by type, focusing on the role of financial status characteristics, psychological characteristics, and demographic characteristics.

Hau (2000) particularly highlights that financial portfolios may have a greater influence than household demographic characteristics in shaping the demand for life insurance. It is evident in literature that the allocation of

financial assets can have an impact on the demand for life insurance. For instance, Fortune (1973) indicates that life insurance is a substitute for primary financial assets. Households may invest more in primary financial assets during bullish financial markets, depressing the flow into life insurance. Headen and Lee (1974) propose a household portfolio model with four interrelated components, including primary securities, cash and cash equivalents, savings, and life insurance sales. Their findings provide limited evidence that life insurance increases with savings. Ferber and Lee (1980) argue that the purchase of life insurance is determined by household spending and saving habits, financial assets, and debts. Brown (1999) presents that households tend to hold term life insurance and private annuities simultaneously. Hau (2000) investigates the impact of life insurance as a liquid financial asset on an insured's death, and finds that saving accounts, bonds, and stocks negatively impact life insurance holdings. The study also reveals evidence that debts have a positive effect on life insurance. Lin and Grace (2007) identify the impact of various types of financial assets on both term and whole life insurance. More recently, Outreville (2013) finds a positive relationship between primary financial assets and life insurance, which is attributed to the good performance of financial markets during a booming economy with high household savings. Shi et al. (2015) suggest that life insurance complements, rather than substitutes, other financial assets in a household's asset allocation decisions.

In addition to financial portfolios, previous research has found that household wealth, as measured by net worth, is an important determinant of the demand for life insurance. Lewis (1989) suggests that life insurance is negatively associated with net worth. Nevertheless, Bernheim (1991), Hau (2000), and Eisenhauer and Halek (1999) have reported a positive correlation between household wealth and life insurance purchases, attributing this to bequest motives and the increasing absolute risk aversion hypothesis. Maremont and Scism (2010) report that the ownership of cash-value life insurance dropped dramatically over the last decade, but the total face value fell at a slower rate. Heo et al. (2013) indicate that cash-value life insurance acts as a complement to, rather than substitute for, wealth. Mulholland et al. (2016) predict that cash-value life insurance ownership will continue to decline among younger households, while the wealthiest households have increased it as an estate planning instrument. Luciano et al. (2016) find that the ratio of income to net worth negatively affects the demand for term life insurance. They suggest that focusing solely on income variables can be misleading, as wealth is playing an increasing role in determining the demand for life insurance.

Moreover, previous research has examined the impact of retirement assets, including social security, on the demand for life insurance. Pissarides (1980) indicates that retirement savings and bequests are dependent on the ability to purchase life insurance. Bernheim (1991) finds that social security benefits lead to a drop in the acquisition of annuities but an increase in life insurance purchases. Hubener et al. (2016) demonstrate that social security rules and family risk have important effects on the optimal life cycle household saving and asset allocation patterns, retirement decisions, and life insurance purchases.

Limited literature has explored the demand for life insurance during economic recessions. The 2007-2009 financial crisis severely impacted global insurance markets, with the segments of annuities and life insurance hit harder than health lines, as they had relatively larger asset portfolios (Baranoff & Sager, 2011). During the crisis, low long-term interest rates, which serve as the valuation basis to determine premiums, guaranteed rates of return, profit-sharing, and policy reserves, created significant financial problems and pressure on profits for life insurers nationwide (Holsboer, 2000). This resulted in an increased use of paid-up options or high lapses on life insurance policies and a large drop in the demand for new policies. For households, the financial crisis led to rising unemployment and declining value of financial assets and household wealth. Swiss Re (2009) reports that sales of equity-linked products declined tremendously during the financial crisis, while non-equity-linked savings products, including fixed annuities and traditional life savings, continued to increase.

After the 2008 financial crisis, households demonstrated an increased risk aversion attitude, with higher precautionary savings (Bricker et al., 2011). Households also tended to have better performance in their behaviors of budgeting, saving, and spending, and have more frequent performance of commonly recommended financial practices, including holding adequate insurance (O'Neill & Xiao, 2012).

Additionally, there are insufficient research attempts that employ panel data to investigate the determinants of the demand for life insurance in a dynamic context. Liebenberg et al. (2012) suggest that a dynamic analysis based on panel data may be better suited to explain the determinants of the demand for life insurance than a static analysis based on cross-sectional data. They analyze the 1983-1989 SCF panel data and find that life events, such as finding a new job and becoming unemployed, have a significant and dynamic impact on changes in life insurance holdings. The same dataset is used by Bertaut (1998) to examine the determinants of stock ownership decisions in a dynamic setting at the household level, and also used by Liebenberg et al. (2010) to explore policy loans of whole life insurance. More recently, Wang (2023) uses the 2007-2009 SCF panel data and reveals a positive relationship between changes in the holdings of primary assets and the ownership choices of life insurance during the financial crisis.

Changes in household portfolio holdings may result from the passive acceptance of portfolio shifts driven by changes in asset prices, or from the active decision-making to rebalance various financial assets in household portfolios (Bricker et al, 2011). Bricker et al. (2011) indicate that the majority of families passively accepted changes in portfolio shares driven by changes in asset prices during the financial crisis with a low frequency of portfolio rebalancing. Hoopes et al. (2016) find that households in the very highest income groups rebalanced their financial portfolios more actively than others throughout the financial crisis, implying that portfolio rebalancing decisions vary across households during recessions. However, prior insurance literature has not distinguished between household portfolio shifts resulting from passive acceptance and those resulting from active decisions of portfolio restructuring. Our study aims to bridge this gap by focusing on examining the impact of households' active portfolio allocation decisions on the demand for life insurance.

Data and Methodology

Data

This paper examines household portfolio allocation decisions that are hypothesized to impact the demand for life insurance in a dynamic setting during the 2008 financial crisis. We use the SCF data, a nationwide household survey that has been used extensively in prior literature to explore the demand for life insurance (Hau, 2000; Lin & Grace, 2007; Liebenberg et al., 2012; Glumov, 2013; Scott & Gilliam, 2014; Wang, 2023)[4]. The SCF data includes information about household characteristics and economic status, as well as the allocation of household portfolios. The data oversamples wealthier households which are expected to hold a variety of financial assets and rebalance their financial portfolios as situations evolve (see Glumov, 2013; Hoopes et al., 2016). In the history of the SCF, only two panel datasets are available: one spanning from 1983 to 1989, and the other from 2007 to 2009[5]. Our study utilizes the more recent dataset, as it holds greater relevance and value[6]. In the 2007

[4] See Liebenberg et al. (2012) for the advantages of studying changes in financial portfolios using the SCF panel data, rather than using other household panel data sources including the Panel Study of Income Dynamics, Consumer Expenditure Surveys, Survey of Income and Program Participation, and Health and Retirement Survey.

[5] See the official SCF website, https://www.federalreserve.gov/econres/scf-previous-surveys.htm, for more information.

[6] We have omitted the years spanning from 1983 to 1989 from our paper due to the lack of relevant inquiries regarding active decision-making for financial portfolios within the 1983-1989 SCF panel survey. The 1983-1989 SCF codebook can be accessed through this website link, https://www.federalreserve.gov/econres/files/1989p_codebk89p.txt. For the specific inquiries regarding household portfolio allocation decisions discussed in this paper, we have sourced data from the 2007-2009

SCF, 89% (3,857) of eligible households agreed to complete a panel interview in 2009, which was included in the 2007-2009 SCF panel data set. This panel data enables us to identify the decision-making for household portfolio allocation as well as the life insurance ownership and coverage for the same household since 2007. Therefore, this data set is well-suited to exploring the dynamic effects of household portfolio allocation decisions on life insurance ownership and coverage decisions.

Methodology to study life insurance ownership: the Probit models

We apply the two-part Cragg model to estimate the determinants of the demand for life insurance (Cragg, 1971; Liebenberg et al., 2012; Wang, 2023), considering that many households in the survey sample do not hold life insurance. This modeling approach allows for a separate analysis of household decisions on life insurance ownership status and coverage amount. Specifically, in the first part, we use Probit regression models to identify the determinants of life insurance ownership decisions for the full sample of households. In the second part, we develop truncated regression models to explore the determinants of life insurance coverage decisions for the subsamples of households that experienced changes in life insurance ownership.

The first part of the Cragg model examines the likelihood of life insurance ownership changes, in relation to those that did not change their life insurance ownership decisions. The changes in life insurance ownership include initiating, increasing, decreasing, and dropping term or whole life insurance. The analysis focuses on four types of households that experienced changes in life insurance ownership from 2007 to 2009: 1) those that initiated or increased term life insurance, 2) those that initiated or increased whole life insurance, 3) those that decreased or dropped term life insurance, and 4) those that decreased or dropped whole life insurance. Equations (1) to (4) represent the Probit regression models that are developed to identify the factors that influence these four life insurance ownership decisions. During the financial crisis, it is hypothesized that households that have made decisions to invest more in cash and cash equivalents, bonds, and retirement assets but less in stocks, pay off debts, spend less, become less aggressive, and invest less for the long term were more likely than other households to change their life insurance ownership decisions.

In these regression models, NewIncrTerm (NewIncrWhole) is an indicator variable that equals 1 for households that initiated a term (whole) life insurance policy or increased term (whole) life insurance coverage since 2007, and 0 otherwise. DropDecrTerm (DropDecrWhole) is an indicator variable that equals 1 for households that dropped a term (whole) life insurance policy or decreased term (whole) life insurance coverage since 2007, and 0 otherwise. The variables of household portfolio allocation decisions include six indicator variables of whether households made decisions to invest more in cash and cash equivalents (InvMoreCash), invest more in bonds (InvMoreBonds), invest less in stock (InvLessStock), invest more in retirement assets (InvMoreRA), invest less in retirement assets (InvLessRA), and pay off debts (PayDebt). Three additional variables of financials decisions that have changed the ways households arrange their money or investments are also hypothesized to affect the demand for life insurance. MoreRiskAver is an indicator variable equal to 1 if households chose to have more conservative or disciplined investments, and 0 otherwise. SpendLess is an indicator variable equal to 1 if households chose to spend less, and 0 otherwise. InvLessLong is an indicator variable equal to 1 if households chose to invest less for the long term, and 0 otherwise.

Control variables are the same in each equation and represent household characteristics and economic status examined in prior research (see Liebenberg et al., 2012; Heo & Grable, 2017; Heo, 2020; Wang, 2023). Specifically, we control for employment (Work), household income (LnIncome), household net worth (LnNetWorth),

SCF panel survey. See Appendix A for these inquiries. While the data are not as current as desired, they are the only source of the necessary information for a broad sample of households that is crucial for our study.

marital status (Married), risk attitude (Risk), stock holdings (StockShare), age (Age3549, Age5064, and Age65_), the number of kids (Kid), race (White), education (College), and homeownership (Homeowner), with their definitions addressed in Table 1.

$$\text{NewIncrTerm}_i = \alpha + \beta_1 \text{InvMoreCash}_i + \beta_2 \text{InvMoreBonds}_i + \beta_3 \text{InvLessStock}_i + \beta_4 \text{InvMoreRA}_i + \beta_5 \text{MoreRiskAver}_i + \beta_6 \text{InvLessLong}_i + \beta_7 \text{DropDecrWhole}_i + \textit{Control Variables} + \varepsilon_i, \quad (1)$$

$$\text{NewIncrWhole}_i = \alpha + \beta_1 \text{InvMoreCash}_i + \beta_2 \text{InvMoreBonds}_i + \beta_3 \text{InvLessStock}_i + \beta_4 \text{InvMoreRA}_i + \beta_5 \text{PayDebt}_i + \beta_6 \text{SpendLess}_i + \beta_7 \text{MoreRiskAver}_i + \beta_8 \text{InvLessLong}_i + \beta_9 \text{DropDecrTerm}_i + \textit{Control Variables} + \varepsilon_i, \quad (2)$$

$$\text{DropDecrTerm}_i = \alpha + \beta_1 \text{InvMoreCash}_i + \beta_2 \text{InvMoreBonds}_i + \beta_3 \text{InvLessStock}_i + \beta_4 \text{InvLessRA}_i + \beta_5 \text{InvLessLong}_i + \beta_6 \text{NewIncrWhole}_i + \textit{Control Variables} + \varepsilon_i, \quad (3)$$

$$\text{DropDecrWhole}_i = \alpha + \beta_1 \text{InvMoreCash}_i + \beta_2 \text{InvMoreBonds}_i + \beta_3 \text{InvLessStock}_i + \beta_4 \text{InvLessRA}_i + \beta_5 \text{PayDebt}_i + \beta_6 \text{SpendLess}_i + \beta_7 \text{InvLessLong}_i + \beta_8 \text{NewIncrTerm}_i + \textit{Control Variables} + \varepsilon_i, \quad (4)$$

Methodology to study life insurance coverage: the Truncated models

In the second part of the Cragg model, we develop truncated regression models to investigate the subsamples of households that have experienced changes in life insurance ownership. As long as the life insurance ownership decisions have been made, households may adjust the amount of their life insurance coverage, resulting in four categories of life insurance coverage decisions: 1) the amount of newly purchased or increased term life insurance coverage, 2) the amount of newly purchased or increased whole life insurance coverage, 3) the amount of decreased or dropped term life insurance coverage, and 4) the amount of decreased or dropped whole life insurance coverage (Liebenberg et al., 2012; Wang, 2023).

Equations (5) to (8) describe the four truncated regression models, developed as the second part of the Cragg model, to explore the determinants of the four categories of life insurance coverage decisions conditional on their ownership decisions. It is hypothesized that, among the subsamples of households that have made decisions to change their life insurance ownership, those that chose to invest more in cash and cash equivalents, bonds, and retirement assets but less in stocks, pay off debts, spend less, become less aggressive, and invest less for the long term made significantly more adjustments to their life insurance coverage, compared to other households during the financial crisis. Here, LnNewIncrTerm (LnNewIncrWhole) is the natural log of the amount of newly purchased or increased term (whole) life insurance coverage, specifically applicable to the households that have chosen to initiate or increase term (whole) life insurance since 2007, where $\text{NewIncrTerm}_i = 1$ ($\text{NewIncrWhole}_i = 1$). LnDropDecrTerm (LnDropDecrWhole) is the natural log of the amount of decreased or dropped term (whole) life insurance coverage, specifically applicable to the households that have chosen to drop or decrease term (whole) life insurance since 2007, where $\text{DropDecrTerm}_i = 1$ ($\text{DropDecrWhole}_i = 1$). The variables of household portfolio allocation decisions and control variables are the same as the previous regressions described by Equations (1) to (4).

$$\text{LnNewIncrTerm}_i = \alpha + \beta_1 \text{InvMoreCash}_i + \beta_2 \text{InvMoreBonds}_i + \beta_3 \text{InvLessStock}_i + \beta_4 \text{InvMoreRA}_i + \beta_5 \text{MoreRiskAver}_i + \beta_6 \text{InvLessLong}_i + \beta_7 \text{LnDropDecrWhole}_i + \textit{Control Variables} + \varepsilon_i, \quad (5)$$

$$\text{LnNewIncrWhole}_i = \alpha + \beta_1 \text{InvMoreCash}_i + \beta_2 \text{InvMoreBonds}_i + \beta_3 \text{InvLessStock}_i + \beta_4 \text{InvMoreRA}_i + \beta_5 \text{PayDebt}_i + \beta_6 \text{SpendLess}_i + \beta_7 \text{MoreRiskAver}_i + \beta_8 \text{InvLessLong}_i + \beta_9 \text{LnDropDecrTerm}_i + \textit{Control Variables} + \varepsilon_i, \quad (6)$$

$$\text{LnDropDecrTerm}_i = \alpha + \beta_1 \text{InvMoreCash}_i + \beta_2 \text{InvMoreBonds}_i + \beta_3 \text{InvLessStock}_i + \beta_4 \text{InvLessRA}_i + \beta_5 \text{InvLessLong}_i + \beta_6 \text{LnNewIncrWhole}_i + \textit{Control Variables} + \varepsilon_i, \quad (7)$$

$$\text{LnDropDecrWhole}_i = \alpha + \beta_1 \text{InvMoreCash}_i + \beta_2 \text{InvMoreBonds}_i + \beta_3 \text{InvLessStock}_i + \beta_4 \text{InvLessRA}_i + \beta_5 \text{PayDebt}_i + \beta_6 \text{SpendLess}_i + \beta_7 \text{InvLessLong}_i + \beta_8 \text{LnNewIncrTerm}_i + \textit{Control Variables} + \varepsilon_i, \quad (8)$$

To address potential endogeneity issues arising from substitution effects, we conducted Wald exogeneity tests for all four Probit models and four Truncated models[7]. These tests failed to reject exogeneity for any of the equations. Hence, we were able to directly apply Probit regressions and Truncated regressions to identify the variables related to household portfolio allocation decisions that have a significant and dynamic impact on life insurance ownership and coverage decisions. In addition, we checked for robustness by incorporating Instrument Variables (IV) for DropDecrWhole, DropDecrTerm, NewIncrWhole, and NewIncrTerm into the Probit regressions described by Equations (1), (2), (3), and (4) respectively, through a two-stage process. In the first stage, for instance, we estimated the predicted values of DropDecrWhole using all the explanatory variables except NewIncrTerm and the control variables specified in Equation (4). In the second stage, we employed the predicted values derived from the first stage as the IV for DropDecrWhole to conduct the Probit regression described by Equation (1). This approach effectively addresses the endogeneity of the independent variable DropDecrWhole, while ensuring that the IV is not correlated with the dependent variable NewIncrTerm in Equation (1). It is noted that our robustness analyses demonstrated no significant deviations from the results we initially obtained regarding the determinants of the demand for life insurance[8].

Results

Summary statistics

Summary statistics and variable definitions of the full sample are reported in Table 1. It shows that around 28% of the households that were re-interviewed in 2009 had initiated or increased their holdings of term life insurance, and 18% had initiated or increased their holdings of whole life insurance since 2007. Additionally, about 29% of the households that owned term life insurance in 2007 had dropped or decreased their coverage in 2009, while 19% of the households that owned whole life insurance in 2007 had dropped or decreased their coverage in 2009 (also see Wang, 2023). Table 2 presents summary statistics for the four subsamples of households that experienced changes in life insurance ownership since 2007.

[7] For example, In Equation (1), DropDecrWhole is included as an explanatory variable that could impact household decisions to purchase term life insurance (NewIncrTerm) in Equation (1). However, NewIncrTerm is included as an explanatory variable that could impact household decisions to drop whole life insurance in Equation (4). This inclusion of substitution effects in both equations may give rise to potential endogeneity concerns. The same as Liebenberg et al. (2012), Wald exogeneity test was applied to check for endogeneity in each equation. If the test indicates that those variables are exogenous, we can estimate the equation using the original Probit or Truncated model as they can provide efficient and consistent results. If the regressors are endogenous, the approach of Two-Stage Least Squares should be used for the equation. We have reported the results of the Wald exogeneity tests in Tables 3, 4, 5, and 6.

[8] We conducted additional analysis to check for robustness. We ran the Probit regressions described by Equations (1) to (4) by adjusting the values of the control variables from 2007 to 2009, given that these four regressions provide the primary source of our key findings. It is noted that the results of this analysis also present no significant deviations from the results outlined in this paper, indicating that the analysis and the results of this paper are robust. The results of these two robustness analyses are presented in Appendix B.

Table 1. Variable Definitions and Summary Statistics for Life Insurance Ownership Decisions (Full Sample)

Variables	Definitions	Mean	Std. Dev.
Life Insurance Ownership Decisions			
NewIncrTerm	equal to 1 for households that initiated a term life insurance policy or increased term life insurance coverage since 2007, and 0 otherwise	0.28	0.45
NewIncrWhole	equal to 1 for households that initiated a whole life insurance policy or increased whole life insurance coverage since 2007, and 0 otherwise	0.18	0.39
DropDecrTerm	equal to 1 for households that dropped a term life insurance policy or decreased term life insurance coverage since 2007, and 0 otherwise	0.29	0.45
DropDecrWhole	equal to 1 for households that dropped a whole life insurance policy or decreased whole life insurance coverage since 2007, and 0 otherwise	0.19	0.39
Portfolio Allocation Decisions			
InvMoreCash	equal to 1 for households that have made decisions to invest more in CDs, other deposits, "cash" since 2007, and 0 otherwise	0.02	0.13
InvMoreBonds	equal to 1 for households that have made decisions to invest more in tax-exempt bonds, Treasury bills/bonds, other bonds since 2007, and 0 otherwise	0.01	0.11
InvLessStock	equal to 1 for households that have made decisions to invest less in stocks since 2007, and 0 otherwise	0.04	0.19
InvMoreRA	equal to 1 for households that have made decisions to invest more in retirement assets (IRA, Keogh, 401(k), Roth, etc.) since 2007, and 0 otherwise	0.01	0.11
InvLessRA	equal to 1 for households that have made decisions to invest less in retirement assets (IRA, Keogh, 401(k), Roth, etc.) since 2007, and 0 otherwise	0.01	0.11
PayDebt	equal to 1 for households that have made decisions to pay off debt since 2007, and 0 otherwise	0.02	0.14
Other Financial Decisions Variables			
SpendLess	equal to 1 if households that have made decisions to spend less, cut back since 2007, and 0 otherwise	0.16	0.37
MoreRiskAver	equal to 1 if households that have made decisions to have more conservative or disciplined investments, be less risk/aggressive since 2007, and 0 otherwise	0.09	0.29
InvLessLong	equal to 1 if households that have made decisions to invest less for the long term since 2007, and 0 otherwise	0.01	0.12

Table 1 (continued). Variable Definitions and Summary Statistics for Life Insurance Ownership Decisions (Full Sample)

Control Variables			
Work	equal to 1 if either spouse was employed in 2007, and 0 otherwise	0.76	0.43
LnIncome	the natural log of household income in 2007	11.57	2.01
LnNetWorth	the natural log of household net worth in 2007	12.12	4.36
Married	equal to 1 for married households in 2007, and 0 otherwise	0.69	0.46
Risk	equal to 1 if households preferred no financial risk in 2007, and 0 otherwise	0.30	0.46
StockShare	the ratio of stock value to household wealth in 2007	5.06	39.02
Age3549	equal to 1 if the age of household respondent was between 35 and 49, and 0 otherwise	0.30	0.46
Age5064	equal to 1 if the age of household respondent was between 50 and 64, and 0 otherwise	0.34	0.47
Age65_	equal to 1 if the age of household respondent was 65 or older, and 0 otherwise	0.21	0.41
Kid	the number of children in the household in 2007	0.88	1.20
White	equal to 1 for white households, and 0 otherwise	0.77	0.42
College	equal to 1 if either spouse had college education in 2007, and 0 otherwise	0.57	0.50
Homeowner	equal to 1 if households owned their primary residence in 2007, and 0 otherwise	0.76	0.43
Observations	3857		
Regression Models	(1) - (4)		

Note: All data variables are taken or calculated from the 2007-2009 SCF panel survey. See Appendix A for more details.

Table 2. Summary Statistics for the Life Insurance Coverage Decisions (Subsamples)

Variables	M	SD	M	SD	M	SD	M	SD
LnNewIncrTerm	11.54	1.80					4.72	5.99
LnDropDecrWhole	3.02	5.17					11.15	2.36
LnNewIncrWhole			11.07	2.37	2.83	4.97		
LnDropDecrTerm			4.75	5.92	11.55	1.92		
InvMoreCash	0.01	0.10	0.02	0.14	0.02	0.13	0.02	0.16
InvMoreBonds	0.01	0.12	0.01	0.11	0.01	0.09	0.02	0.14
InvLessStock	0.03	0.18	0.05	0.21	0.03	0.18	0.05	0.21
InvMoreRA	0.02	0.14	0.01	0.08				
InvLessRA					0.02	0.14	0.01	0.08
PayDebt			0.03	0.16			0.02	0.13
SpendLess			0.17	0.37			0.16	0.37
MoreRiskAver	0.08	0.28	0.10	0.31				
InvLessLong	0.02	0.14	0.01	0.10	0.01	0.09	0.02	0.13
Work	0.84	0.36	0.77	0.42	0.83	0.37	0.76	0.43
LnIncome	11.67	1.72	12.00	2.14	11.76	1.93	12.18	2.13
LnNetWorth	12.26	3.84	13.44	3.56	12.55	3.92	13.76	3.25
Married	0.75	0.43	0.75	0.44	0.76	0.43	0.80	0.40
Risk	0.24	0.43	0.25	0.43	0.27	0.44	0.18	0.39
StockShare	3.99	14.09	4.64	11.80	5.94	69.43	5.79	13.72
Age3549	0.38	0.48	0.27	0.45	0.30	0.46	0.24	0.43
Age5064	0.33	0.47	0.38	0.48	0.41	0.49	0.42	0.49
Age65_	0.12	0.33	0.26	0.44	0.16	0.37	0.26	0.44
Kid	1.01	1.21	0.82	1.15	0.94	1.19	0.88	1.20
White	0.79	0.41	0.80	0.40	0.78	0.42	0.84	0.37
College	0.62	0.49	0.64	0.48	0.63	0.48	0.68	0.47
Homeowner	0.79	0.40	0.86	0.35	0.81	0.39	0.89	0.32
Observations	1078		700		1103		724	
Subsamples	NewIncrTerm =1		NewIncrWhole =1		DropDecrTerm =1		DropDecrWhole =1	
Regression Models	(5)		(6)		(7)		(8)	

Note 1: As described in Section 3, LnNewIncrTerm (LnNewIncrWhole) is defined as the natural log of the amount of newly purchased or increased term (whole) life insurance coverage, specifically applicable to the households that have chosen to initiate or increase term (whole) life insurance since 2007, where $NewIncrTerm_i = 1$ ($NewIncrWhole_i = 1$). LnDropDecrTerm (LnDropDecrWhole) is defined as the natural log of the amount of newly purchased or increased whole life insurance coverage, specifically applicable to the households that have chosen to drop or decrease term (whole) life insurance since 2007, where $DropDecrTerm_i = 1$ ($NewIncrWhole_i = 1$).
Note 2: All data variables are taken or calculated from the 2007-2009 SCF panel survey. See Appendix A for more details.

Results for New Life Insurance Ownership and Coverage

Tables 3, 4, 5, and 6 report the variables of household portfolio allocation decisions that have a significant and dynamic impact on life insurance ownership and coverage decisions, while holding the other determinants of the demand for life insurance constant.

Table 3 shows the results for new life insurance ownership. It indicates that households that have made decisions to invest more in cash and cash equivalents are less likely to initiate or increase term life insurance. By holding more cash and cash equivalents, households could gain financial security and confidence in relying on the accumulated cash savings should unforeseen circumstances arise. Consequently, they may exhibit reduced risk aversion and choose to self-insure instead of holding term life insurance to offset potential financial losses resulting from premature death. Furthermore, from the perspective of the total portfolio picture, households might perceive their most liquid financial assets as an avenue to explore investments in alternative assets that possess the potential for higher returns compared to life insurance. So they could be reluctant in directing their surplus cash towards life insurance, particularly when confronted with other financial priorities during recessions.

In Table 3, the results also indicate that households that have determined to increase their investment in retirement assets are more likely to initiate or increase term life insurance. Given that retirement assets represent a substantial portion of household wealth, this finding suggests that household wealth may play a positive role in driving the demand for term life insurance (Headen & Lee, 1974; Bernheim, 1991; Hau 2000; Lin & Grace 2007; Shi et al., 2015; Mulholland et al., 2016). This insight implies that improved financial wellbeing may lead to an increase in the demand for term life insurance, particularly during periods of economic downturns. The proximity to and familiarity with financial markets could potentially contribute to this trend, as these factors tend to bolster both engagement in financial markets and the insurance market (Luciano et al., 2016). Additionally, diversification could emerge as an additional factor. Term life insurance can add another layer of protection beyond the relatively less liquid retirement investments, thereby mitigating overall financial risk for households. Furthermore, the results for new life insurance coverage shown in Table 4 demonstrate that, among the households that chose to initiate or increase term life insurance, those that invested more in retirement assets tend to increase significantly more coverage than others. It is implied that the flow of household funds into risky assets can positively impact their holding of new or more term life insurance during recessions. Increasing investments for retirement in conjunction with the acquisition or expansion of term life insurance coverage for risk management can constitute fundamental elements of a comprehensive and prudent financial planning strategy, particularly in the context of a financial crisis.

Table 3 also indicates that households that have determined to increase their investment in retirement assets are less likely to initiate or increase whole life insurance. It suggests that household wealth tends to diminish the demand for whole life insurance that has a saving function. Households focusing on bolstering their retirement investments could find that the cost of whole life insurance can limit the amount of funds they can allocate to retirement assets during recessions. These households might have a higher risk tolerance and a greater propensity to invest in assets offering potentially higher returns compared to whole life insurance, which emphasizes stability and guaranteed or moderate returns.

In addition to the active allocation of financial assets in household portfolios, the results of Table 3 also demonstrate that household decisions to pay off debts can impact the ownership of whole life insurance. It shows that households that have decided to pay off debts are more likely to initiate or increase whole life insurance. The cash value of whole life insurance holds the potential to serve as a resource for debt or loan repayment (Ferber & Lee, 1980; Hau, 2000; Lin & Grace, 2007; Wang, 2023). Incorporating whole life insurance into a debt repayment strategy can

contribute to enhancing household financial stability during economic recessions.

We also explore the impact of other financial decisions made by households on their new life insurance ownership. According to Table 3, households that have reduced their spending during recessionary periods are more likely to initiate or increase whole life insurance. This suggests that as households become more risk averse due to reduced spending during a financial crisis, they tend to purchase whole life insurance and uphold sufficient life insurance coverage (Bricker et al., 2011; Scott & Gilliam, 2014). Additionally, Table 3 reveals that households demonstrating more conservative or disciplined financial behaviors are less likely to initiate or increase term life insurance during recessions. Tables 3 also shows that households that have opted to invest less for the long term are more likely to initiate or increase term life insurance. This suggests that term life insurance may not be considered an essential element of long-term household financial planning.

Results for Dropped Life Insurance Ownership and Coverage

Table 5 shows the results for dropped life insurance ownership. It indicates that households that have made decisions to increase their investment in bonds are less likely to decrease or drop term life insurance during the financial crisis. This suggests a positive relationship between allocating more funds to bonds and the ownership of term life insurance. Bonds represent a less risky investment choice compared to stocks and other higher-risk assets. Households concentrating on risk mitigation or financial stability might recognize the value of maintaining term life insurance coverage in conjunction with their bond investments during periods of recession. While prior studies find a substitution effect between term life insurance and lower-risk assets like bonds (Fortune, 1973; Hau, 2000; Lin & Grace, 2007), our paper implies that this effect may result from passive acceptance of household portfolio shifts rather than active decision-making for portfolio allocation in bonds.

Table 5 also indicates that households might perceive a reduced need for term life insurance if they are investing less in retirement assets. A reduction of retirement investments might arise due to budget constraints, leading to a decline in term life insurance.

Table 5 also shows the impact of other financial decisions made by households on the dropped life insurance ownership. It reveals that households spending less are more likely to drop or reduce their existing whole life insurance. This relationship can be attributed to liquidity constraints faced by households (Bernheim et al., 1999). As households have tightened their budgets and prioritized essential expenses during economic recessions, they may consider their current whole life insurance as an option for cost reduction. The cash value component of whole life insurance can also serve as an asset that can be accessed during recessions. Consequently, they may choose to reduce or terminate whole life insurance, or borrow the cash value (Cole & Fire, 2021). Additionally, Table 5 shows that households that have made decisions to invest less for the long term are less likely to drop or reduce term life insurance. Furthermore, these households tend to drop or reduce significantly more term life insurance coverage than other households once they have made decisions to drop, as indicated in Table 6. This finding can be attributed to a lower level of familiarity and engagement with financial markets among households that lack long-term financial planning (Luciano et al., 2016).

Table 3. Results for New Life Insurance Ownership

Dependent Variable	**NewIncrTerm**			**NewIncrWhole**		
Independent Variables	**Coefficient Estimate**	**Standard Error**		**Coefficient Estimate**	**Standard Error**	
InvMoreCash	-0.4109	0.1878	**	-0.0569	0.1807	
InvMoreBonds	0.2112	0.2064		-0.2030	0.2323	
InvLessStock	-0.0853	0.1271		0.1238	0.1294	
InvMoreRA	0.3857	0.1932	**	-0.4559	0.2747	*
PayDebt				0.3035	0.1642	*
SpendLess				0.1529	0.0666	**
MoreRiskAver	-0.1422	0.0796	*	-0.0932	0.0835	
InvLessLong	0.3415	0.1809	*	-0.3390	0.2268	
DropDecrWhole	0.4188	0.0556	***			
DropDecrTerm				0.3553	0.0517	***
Work	0.1409	0.0645	**	-0.0135	0.0694	
LnIncome	-0.0095	0.0147		0.0175	0.0165	
LnNetWorth	-0.0041	0.0082		0.0411	0.0107	***
Married	0.1455	0.0551	***	0.0113	0.0608	
Risk	-0.1051	0.0569	*	-0.0210	0.0633	
StockShare	-0.0007	0.0011		-0.0041	0.0021	*
Age3549	0.0216	0.0707		0.0816	0.0883	
Age5064	-0.2609	0.0765	***	0.1391	0.0919	
Age65_	-0.5752	0.0961	***	0.2936	0.1080	***
Kid	-0.0149	0.0207		-0.0076	0.0237	
White	0.0856	0.0571		-0.0710	0.0643	
College	0.0471	0.0526		0.0585	0.0587	
Homeowner	0.1681	0.0695	**	0.0909	0.0799	
Intercept	-0.7018	0.1543	***	-1.9193	0.1743	***
Observations	3857			3857		
Pseudo R-Square	0.057			0.043		
Wald Exogeneity Test	0.541			0.555		
Regression Models	(1)			(2)		

Note 1: The model for each type of life insurance is a Probit based on the full sample. We reported the Probit results here, as the Wald test for exogeneity is not rejected.
Note 2: Variables definitions and summary statistics in these two regressions were listed in Table 1.
Note 3: Statistical significance at the 1, 5, and 10 percent levels is denoted by ***, ** and *, respectively.

Table 4. Results for New Life Insurance Coverage

Dependent Variable	**LnNewIncrTerm**			**LnNewIncrWhole**		
Independent Variables	**Coefficient Estimate**	**Standard Error**		**Coefficient Estimate**	**Standard Error**	
InvMoreCash	-0.2925	0.4126		-0.0189	0.5600	
InvMoreBonds	0.4328	0.3656		1.0510	0.7432	
InvLessStock	0.0919	0.2502		-0.3983	0.3908	
InvMoreRA	0.5878	0.3175	*	0.3033	0.9882	
PayDebt				-0.4682	0.4601	
SpendLess				-0.2011	0.2088	
MoreRiskAver	0.0213	0.1562		0.0094	0.2550	
InvLessLong	-0.1420	0.3072		-0.8170	0.7599	
LnDropDecrWhole	0.0550	0.0084	***			
LnDropDecrTerm				0.0137	0.0127	
Work	0.5749	0.1329	***	0.2486	0.2131	
LnIncome	0.3164	0.0331	***	0.3464	0.0468	***
LnNetWorth	0.0663	0.0163	***	0.1678	0.0332	***
Married	0.7232	0.1082	***	0.5705	0.1927	***
Risk	-0.2905	0.1154	**	0.0113	0.2017	
StockShare	0.0038	0.0031		-0.0090	0.0069	
Age3549	-0.0292	0.1314		-0.9426	0.3117	***
Age5064	-0.5671	0.1416	***	-1.4542	0.3255	***
Age65_	-1.0423	0.1895	***	-1.9376	0.3672	***
Kid	0.0722	0.0403	*	0.1033	0.0750	
White	-0.0369	0.1107		-0.2393	0.2045	
College	0.1792	0.0985	**	0.2785	0.1886	
Homeowner	-0.2024	0.1320		-0.4381	0.2580	*
Intercept	6.2106	0.3415	***	5.6857	0.5477	***
Observations	1078			700		
Subsamples	NewIncrTerm = 1			NewIncrWhole = 1		
Wald Exogeneity Test	0.861			0.219		
Regression Models	(5)			(6)		

Note 1: The model for each type of life insurance is a Truncated regression, based on the subsample of households with new policies. We reported the Truncated results here, as the Wald test for exogeneity is not rejected.
Note 2: These variables were defined in Tables 1 and 2. Summary statistics was reported in Table 2.
Note 3: Statistical significance at the 1, 5, and 10 percent levels is denoted by ***, ** and *, respectively.

Table 5. Results for Dropped Life Insurance Ownership

Dependent Variable	DropDecrTerm			DropDecrWhole		
Independent Variables	**Coefficient Estimate**	**Standard Error**		**Coefficient Estimate**	**Standard Error**	
InvMoreCash	-0.0600	0.1688		0.1154	0.1714	
InvMoreBonds	-0.3818	0.2244	*	0.1549	0.2080	
InvLessStock	-0.0467	0.1245		-0.0124	0.1303	
InvLessRA	0.3744	0.1886	**	-0.3394	0.2527	
PayDebt				-0.0707	0.1832	
SpendLess				0.1514	0.0676	**
InvLessLong	-0.3908	0.2046	*	-0.0986	0.1988	
NewIncrWhole	0.3724	0.0549	***			
NewIncrTerm				0.4085	0.0529	***
Work	0.2817	0.0637	***	-0.0808	0.0693	
LnIncome	-0.0031	0.0145		0.0116	0.0163	
LnNetWorth	-0.0104	0.0083		0.0333	0.0109	***
Married	0.1878	0.0546	***	0.1645	0.0628	***
Risk	0.0212	0.0561		-0.2369	0.0662	***
StockShare	0.0004	0.0006		-0.0011	0.0019	
Age3549	0.1153	0.0736		0.0069	0.0914	
Age5064	0.3058	0.0775	***	0.3206	0.0934	***
Age65_	0.0555	0.0954		0.4174	0.1105	***
Kid	0.0047	0.0208		0.0546	0.0235	**
White	-0.0403	0.0565		0.0018	0.0669	
College	0.0935	0.0523	*	0.0386	0.0592	
Homeowner	0.1488	0.0693	**	0.1504	0.0828	*
Intercept	-1.1260	0.1530	***	-1.9970	0.1742	***
Observations	3857			3857		
Pseudo R-Square	0.044			0.069		
Wald Exogeneity Test	0.520			0.864		
Regression Models	(3)			(4)		

Note 1: The model for each type of life insurance is a Probit regression to examine the determinants of dropped policy ownership status based on the full sample. We reported the Probit results here, as the Wald test for exogeneity is not rejected.
Note 2: Variables definitions and summary statistics in these two regressions were listed in Table 1.
Note 3: Statistical significance at the 1, 5, and 10 percent levels is denoted by ***, ** and *, respectively.

Table 6. Results for Dropped Life Insurance Coverage

Dependent Variable	LnDropDecrTerm			LnDropDecrWhole		
Independent Variables	**Coefficient Estimate**	**Standard Error**		**Coefficient Estimate**	**Standard Error**	
InvMoreCash	-0.3747	0.3349		-0.1317	0.4902	
InvMoreBonds	-0.1010	0.4960		-0.5793	0.5468	
InvLessStock	-0.1350	0.2465		0.4601	0.3697	
InvLessRA	0.0263	0.3165		-0.3573	0.8963	
PayDebt				0.3427	0.5738	
SpendLess				-0.1017	0.2027	
InvLessLong	1.4451	0.4570	***	0.3396	0.5768	
LnNewIncrWhole	0.0298	0.0087	***			
LnNewIncrTerm				0.0567	0.0125	***
Work	0.2246	0.1361	*	0.4849	0.2052	**
LnIncome	0.3002	0.0295		0.2311	0.0493	***
LnNetWorth	0.1222	0.0172	***	0.2518	0.0364	***
Married	0.4033	0.1134	***	0.4452	0.2052	**
Risk	-0.2903	0.1111	***	0.1514	0.2114	
StockShare	-0.0001	0.0006		-0.0002	0.0059	
Age3549	-0.5806	0.1579	***	-0.5270	0.3059	*
Age5064	-0.5850	0.1624	***	-0.9374	0.3079	***
Age65_	-1.3084	0.2002	***	-1.1187	0.3514	***
Kid	0.1496	0.0416	***	0.0820	0.0743	
White	-0.0638	0.1097		-0.4781	0.2161	**
College	0.4972	0.1043	***	0.1054	0.1774	
Homeowner	0.0331	0.1434		-0.2345	0.2819	
Intercept	6.1824	0.3201	***	5.1278	0.5338	***
Observations	1103			724		
Subsamples	DropDecrTerm = 1			DropDecrWhole = 1		
Wald Exogeneity Test	0.841			0.59		
Regression Models	(7)			(8)		

Note 1: The model for each type of life insurance is a Truncated regression to examine the determinants of dropped policy coverage, based on the subsample of households with dropped policies. We reported the Truncated results here, as the Wald test for exogeneity is not rejected. Note 2: These variables were defined in Tables 1 and 2. Summary statistics was reported in Table 2. Note 3: Statistical significance at the 1, 5, and 10 percent levels is denoted by ***, ** and *, respectively.

Conclusions and Implications

Household financial decisions are interdependent and essential to both household financial well-being and social welfare (Gomes et al., 2021). Bhamra and Uppal (2019) suggest a multiplier effect that small biases in household financial decisions can lead to large economic losses, not just for individual households, but also for society. Previous research has examined the demand for life insurance as a function of household demographic characteristics and economic status, including household portfolio holdings. Household portfolio shifts can arise from active decision-making for portfolio allocation, or from passive acceptance of asset price changes (Bricker et al., 2011). The differentiation between these two aspects has not been explored in the insurance literature. Our paper aims to fill the gap by exploring the relationship between the active decision-making for portfolio allocation and the demand for life insurance. In addition, the disparities observed in demand determinants between term and whole life insurance in our study indicate the importance of classifying life insurance by type, in line with previous literature (Lin & Grace, 2007; Grable, 2016; Heo et al., 2021). Moreover, the scarcity of research employing household panel data and the limited attention given to recessionary periods in the literature further demonstrate the significance of our study (Liebenberg et al., 2012).

Our results indicate that household portfolio allocation decisions have a significant and dynamic impact on life insurance ownership, while having a limited impact on life insurance coverage during recessions. The significant and influential factors of household portfolio allocation decisions found in this paper can be useful predictors of changes in the demand for life insurance at the household level during recessionary times. Specifically, the results indicate that households deciding to invest more in cash and cash equivalents are less likely to initiate or increase term life insurance during the financial crisis. The results also suggest that during recessions, the ownership of term life insurance is likely to be a complement for the allocation of household portfolios in retirement assets, while the ownership of whole life insurance is likely to be a substitute. Additionally, the results demonstrate that households deciding to invest more in bonds are less likely to drop or reduce term life insurance. The results also demonstrate that households that have decided to pay off debts are more likely to initiate or increase their whole life insurance.

The insights from this study can be beneficial for life insurers, financial planning practitioners, and social policymakers in estimating the demand for life insurance and developing production and marketing strategies for different economic conditions. The findings highlight the importance of considering households' active decisions of portfolio allocation in creating these strategies, which can help life insurance agents and financial planning practitioners offer adaptive and comprehensive financial services to households whose financial decisions may change during recessions. The findings are especially valuable for financial practitioners who serve wealthier households with a diverse range of financial assets and a propensity to adjust their portfolio compositions in response to evolving economic conditions.

First, our results indicate that promoting the allocation of household portfolios in retirement assets and fostering the participation in financial markets can potentially boost the demand for term life insurance. From the perspective of the overall household portfolios, concurrently managing retirement planning through investments in risky assets and risk mitigation through term life insurance could represent a more comprehensive and prudent strategy for household financial planning. This holds particular importance for wealthier households in need of tailored advice to optimize their investments and risk management strategies.

Second, our findings suggest that households can be better served when financial researchers and practitioners more carefully identify and accommodate the demand for different types of life insurance. It is recommended that term life insurance can be promoted to households that have decided to increase their investments in retirement assets and bonds, while whole life insurance can be targeted towards households aiming to pay off debts. These recommendations

can help financial service companies and practitioners tailor their strategies to align with the needs of households during economic downturns, ensuring that households have adequate life insurance coverage to protect against financial hardships.

Third, our findings suggest that the growth of household wealth may stimulate the demand for term life insurance as a safeguard against financial losses during periods of economic downturns. Nevertheless, it is suggested that the growth of household wealth may crowd out the new demand for whole life insurance which has a function of savings.

Fourth, our results imply that the efforts to enhance household liquidity status, promote conservative or disciplined financial behavior, and encourage long-term investments may not necessarily have the intended positive impact on boosting the demand for term life insurance. Instead, these strategies might have an adverse effect or fail to produce the anticipated results during economic downturns.

Finally, the analysis of determinants influencing household decisions to drop or reduce life insurance can assist in identifying households that are more prone to experiencing financial hardships following a financial crisis. Our results indicate that households deciding to invest less in retirement assets are more likely to drop or reduce term life insurance, and households deciding to spend less are more likely to drop or reduce whole life insurance compared to other households. Prioritizing these households becomes crucial for social policymakers seeking to mitigate household financial hardships due to inadequate life insurance during recessions.

One limitation of this study is that the scope of active decision-making for portfolio allocation could include the scenario where households actively choose to retain their current allocation, an aspect not explicitly addressed in our research. A future direction of our study involves establishing connections between household financial decisions, including choices in insurance markets, and the potential impacts of macroeconomic policies. This endeavor aims to enhance household financial well-being and overall social welfare.

Appendix A

Survey questions about the demand for life insurance and the household portfolio allocation decisions in the codebook of the 2007-2009 Survey of Consumer Finances Panel Data Set are listed as follows. For more information, see https://www.federalreserve.gov/econres/files/codebk2009p.txt.

1. The Ownership of Term Life Insurance

   X4002: QUESTION TEXT SAME AS 2009 VERSION

   P4002: The two major types of life insurance are term and cash-value policies. Term policies pay a benefit if the insured person dies, but otherwise have no value. They are often provided through an employer or union, but may also be bought by individuals. Cash-value policies also pay a death benefit, but differ in that they build up a value as premiums are paid. Are any of your (family's) policies term insurance?

2. The Coverage of Term Life Insurance

   X4003: QUESTION TEXT SAME AS 2009 VERSION

   P4003: What is the current face value of all the term life policies that you (and your family living here) have? (THE FACE VALUE OF A POLICY IS WHAT THE POLICY WOULD PAY IN THE EVENT OF DEATH)

3. The Ownership of Whole Life Insurance

   X4004: QUESTION TEXT SAME AS 2009 VERSION

   P4004: Do you have any policies that build up a cash value or that you can borrow on? These are sometimes called "whole life", "straight life", or "universal life" policies.

4. The Coverage of Whole Life Insurance

   X4005: QUESTION TEXT SAME AS 2009 VERSION

   P4005: What is the current face value of all of the policies that build up a cash value? (THE FACE VALUE OF A POLICY IS WHAT THE POLICY WOULD PAY IN THE EVENT OF DEATH.)

   X4006: QUESTION TEXT SAME AS 2009 VERSION

   P4006: If you cancelled these policies now, how much would you receive from the insurance company for the payments you have made up to now? That is, what is the current "cash value" of the policies?

5. Household Portfolio Allocation Decisions

P091460: Over this time, have you (and your family) made decisions to change the ways you arrange your money or investments?

P091421: Generally, what were those decisions?

CODE ALL THAT APPLY

2) Invest more in CDs, other deposits, "cash"

3) Invest less in stocks

12) Invest more in tax-exempt bonds

14) Invest more in Treasury bills/bonds

16) Invest more in other bonds

17) Invest less in retirement assets (IRA, Keogh, 401(k), Roth, etc.)

18) Invest more in retirement assets (IRA, Keogh, 401(k), Roth, etc.)

27) Invest less for the long term

46) More conservative/disciplined investments; less risk/aggressive

65) Spend less, cut back

88) Pay off debt

Appendix B

Table B1. Robustness Test Results for New Life Insurance Ownership Using the IV Approach

Dependent Variable	**NewIncrTerm**			**NewIncrWhole**		
Independent Variables	**Coefficient Estimate**	**Standard Error**		**Coefficient Estimate**	**Standard Error**	
InvMoreCash	-0.3532	0.1783	**	-0.0457	0.1799	
InvMoreBonds	0.4087	0.2058	**	-0.0956	0.2911	
InvLessStock	-0.1164	0.1247		0.1323	0.1281	
InvMoreRA	0.3705	0.1947	*	-0.4277	0.2662	
PayDebt				0.3190	0.1685	*
SpendLess				0.1465	0.0668	**
MoreRiskAver	-0.1436	0.0793	*	-0.0884	0.0824	
InvLessLong	0.2979	0.1764	*	-0.2173	0.2760	
DropDecrWhole (IV)	-2.8799	1.0204	***			
DropDecrTerm (IV)				1.2009	1.3608	
Work	0.0852	0.0668		-0.0885	0.1392	
LnIncome	0.0107	0.0153		0.0177	0.0177	
LnNetWorth	0.0143	0.0100		0.0427	0.0125	***
Married	0.2826	0.0701	***	-0.0427	0.1034	
Risk	-0.2871	0.0797	***	-0.0227	0.0639	
StockShare	-0.0013	0.0013		-0.0044	0.0021	*
Age3549	0.0176	0.0706		0.0490	0.1018	
Age5064	-0.0226	0.1048		0.0462	0.1704	
Age65_	-0.2841	0.1315	*	0.2676	0.1104	*
Kid	0.0316	0.0246		-0.0077	0.0235	
White	0.0945	0.0578		-0.0607	0.0672	
College	0.0860	0.0550		0.0304	0.0746	
Homeowner	0.2677	0.0760	***	0.0475	0.1059	
Intercept	-0.8122	0.1503	***	-1.9914	0.2378	***
Observations	3857			3857		
Pseudo R-Square	0.046			0.032		
Regression Models	(1)			(2)		

Note: The results of this robustness check by using the Instrumental Variable (IV) approach presented in Table B1 show that new term life insurance ownership is negatively associated with household decisions to invest more in cash and cash equivalents and to become more risk averse, and positively associated with household decisions to invest more in retirement assets and less for the long term; and new whole life insurance ownership is positively associated with household decisions to pay off debts and to spend less during recessions. All these results largely confirm our findings in this paper.

Table B2. Robustness Test Results for Dropped Life Insurance Ownership Using the IV Approach

Dependent Variable	**DropDecrTerm**			**DropDecrWhole**		
Independent Variables	**Coefficient Estimate**	**Standard Error**		**Coefficient Estimate**	**Standard Error**	
InvMoreCash	-0.0810	0.1702		0.1050	0.2051	
InvMoreBonds	-0.4368	0.2241	*	0.1551	0.2275	
InvLessStock	-0.0267	0.1272		-0.0094	0.1327	
InvLessRA	0.3908	0.1829	**	-0.3009	0.2641	
PayDebt				-0.0587	0.1873	
SpendLess				0.1501	0.0669	**
InvLessLong	-0.4431	0.2146	**	-0.0959	0.2277	
NewIncrWhole (IV)	-0.3176	0.8378				
NewIncrTerm (IV)				0.4317	1.0116	
Work	0.2845	0.0629	***	-0.0822	0.0799	
LnIncome	0.0001	0.0148		0.0117	0.0176	
LnNetWorth	-0.0050	0.0100		0.0313	0.0114	**
Married	0.1911	0.0550	***	0.1618	0.0803	*
Risk	0.0199	0.0569		-0.2324	0.0775	**
StockShare	0.0003	0.0004		-0.0012	0.0017	
Age3549	0.1272	0.0742	.	0.0060	0.0927	
Age5064	0.3311	0.0836	***	0.3185	0.1236	**
Age65_	0.1078	0.1134		0.4120	0.2008	*
Kid	0.0046	0.0202		0.0554	0.0231	*
White	-0.0556	0.0596		0.0059	0.0732	
College	0.1033	0.0539		0.0350	0.0638	
Homeowner	0.1679	0.0735	*	0.1454	0.1025	
Intercept	-1.1304	0.1498	***	-1.9594	0.3301	***
Observations	3857			3857		
Pseudo R-Square	0.033			0.055		
Regression Models	(3)			(4)		

Note: The results of this robustness check by using the IV approach presented in Table B2 show that dropped term life insurance ownership is negatively associated with household decisions to invest more in bonds and less for the long term, and positively associated with household decisions to invest less in retirement assets; and dropped whole life insurance ownership is positive associated with household decisions to spend less. All these results largely confirm our findings in this paper.

Table B3. Robustness Test Results for New Life Insurance Ownership Using the 2009 Control Variables

Dependent Variable	NewIncrTerm			NewIncrWhole		
Independent Variables	**Coefficient Estimate**	**Standard Error**		**Coefficient Estimate**	**Standard Error**	
InvMoreCash	-0.4342	0.1883	**	-0.0672	0.1804	
InvMoreBonds	0.2006	0.2065		-0.2031	0.2315	
InvLessStock	-0.0774	0.1272		0.1012	0.1295	
InvMoreRA	0.3804	0.1936	**	-0.4773	0.2762	*
PayDebt				0.2801	0.1652	*
SpendLess				0.1677	0.0674	**
MoreRiskAver	-0.1729	0.0798	**	-0.1041	0.0835	
InvLessLong	0.3453	0.1815	*	-0.3413	0.2278	
DropDecrWhole	0.4119	0.0555	***			
DropDecrTerm				0.3620	0.0519	***
Work09	0.1653	0.0592	***	-0.0546	0.0633	
LnIncome09	0.0349	0.0121	***	0.0017	0.0115	
LnNetWorth09	-0.0035	0.0067		0.0421	0.0085	***
Married09	0.2059	0.0528	***	0.1001	0.0581	*
Risk09	-0.0837	0.0532		-0.0722	0.0595	
StockShare09	-0.0028	0.0023		-0.0025	0.0024	
Age3549_09	0.1097	0.0771		-0.1405	0.0961	
Age5064_09	-0.1313	0.0811		0.0137	0.0971	
Age65_09	-0.4638	0.0976	***	0.1618	0.1103	
Kid09	0.0001	0.0207		0.0149	0.0242	
White09	0.0769	0.0576		-0.1137	0.0651	*
College09	-0.0099	0.0502		0.0081	0.0557	
Homeowner09	0.1195	0.0683	*	0.2456	0.0815	***
Intercept	-1.2581	0.1478	***	-1.7069	0.1607	***
Observations	3857			3857		
Pseudo R-Square	0.066			0.052		
Regression Models	(1)			(2)		

Note: The results of the robustness check by using the 2009 control variables presented in Table B3 show that new term life insurance ownership is negatively associated with household decisions to invest more in cash and cash equivalents and to become more risk averse, and positively associated with household decisions to invest more in retirement assets and less for the long term; and new whole life insurance ownership is negatively associated with household decisions to invest more in retirement assets, and positively associated with household decisions to pay off debts and to spend less during recessions. All these results largely confirm our findings in this paper.

Table B4. Robustness Test Results for Dropped Life Insurance Ownership Using the 2009 Control Variables

Dependent Variable	DropDecrTerm			DropDecrWhole		
Independent Variables	**Coefficient Estimate**	**Standard Error**		**Coefficient Estimate**	**Standard Error**	
InvMoreCash	-0.0459	0.1685		0.1449	0.1705	
InvMoreBonds	-0.3525	0.2255		0.1711	0.2077	
InvLessStock	-0.0600	0.1246		-0.0073	0.1294	
InvLessRA	0.4102	0.1882	**	-0.3486	0.2517	
PayDebt				-0.0973	0.1825	
SpendLess				0.1631	0.0673	**
InvLessLong	-0.3342	0.2037	*	-0.0617	0.1984	
NewIncrWhole	0.3773	0.0550	***			
NewIncrTerm				0.3991	0.0527	***
Work09	0.1501	0.0575	***	-0.0240	0.0635	
LnIncome09	-0.0139	0.0107		0.0171	0.0121	
LnNetWorth09	-0.0109	0.0065	*	0.0189	0.0080	**
Married09	0.1592	0.0516	***	0.1166	0.0581	**
Risk09	0.1334	0.0519	**	-0.1452	0.0597	**
StockShare09	0.0009	0.0007		0.0008	0.0007	
Age3549_09	0.0483	0.0796		0.0723	0.1000	
Age5064_09	0.2570	0.0816	***	0.3277	0.1007	***
Age65_09	-0.0300	0.0965		0.4873	0.1143	***
Kid09	-0.0162	0.0211		0.0200	0.0241	
White09	-0.0183	0.0566		0.0198	0.0665	
College09	0.1318	0.0493	***	0.0184	0.0549	
Homeowner09	0.1855	0.0675	***	0.2135	0.0807	***
Intercept	-0.9006	0.1396	***	-1.9695	0.1653	***
Observations	3857			3857		
Pseudo R-Square	0.040			0.059		
Regression Models	(3)			(4)		

Note: The results of the robustness check by using the 2009 control variables presented in Table B4 show that dropped term life insurance ownership is negatively associated with household decisions to invest less for the long term, and positively associated with household decisions to invest less in retirement assets; and dropped whole life insurance ownership is positive associated with household decisions to spend less. All these results largely confirm our findings in this paper.

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