

THREE ESSAYS ON FINANCIAL LITERACY,
FINANCIAL SELF-AWARENESS, AND RETIREMENT WELL-BEING

By

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ABSTRACT

There has been increasing concern about the level of financial literacy of the U.S. population, an increase associated with the greater individual responsibility for retirement planning and the recent financial crisis which placed retirement plans in jeopardy. While there may be general consensus that increased understanding of financial transaction may be beneficial, it remains unclear what types of financial knowledge or what types of financial behavior are most vital to good financial planning, and more importantly, whether greater financial knowledge makes a difference to later life financial well-being, and therefore should be promoted through financial literacy education.

This study addresses these concerns in three separate but related essays. In essay 1, I introduce a new measure of financial “literacy,” which I term “financial self-awareness,” that captures important aspects of financial literacy that are not represented in other existing definitions. Financial self-awareness is derived from questions about individuals’ knowledge of their own financial assets, and is intended to represent the general knowledge and mindset associated with management of financial life. This measure reflects individuals’ financial behavior in terms of the degree to which they may monitor and are alert to their financial assets. In essay 2, inspired by modified human capital theory that incorporates psychological human capital, I examine whether personality traits and psychological orientations help explain variations in the level of financial self-awareness in later life. Using data from the Wisconsin Longitudinal Study (WLS), I examine the role of personality traits and psychological characteristics in effecting financial self-awareness, as direct effects or as mediators in the relationship

between cognition and financial self-awareness, as a way to validate whether financial self-awareness is a distinct measure, or just merely a proxy for human capital. In essay 3, using the measure of financial self-awareness, I examine the consequences of being financially self-aware on retirement well-being, as measured by wealth accumulation. I hypothesize that individuals who are more financially self-aware in the ways I measure that status, that is, not necessarily extremely savvy about investment or financial markets, but having a clear sense of their financial asset situation and paying attention to it, will accumulate higher levels of wealth over their lifetimes, resulting in higher accumulated wealth in late life.

Results from the two empirical essays demonstrate that financial self-awareness is a separate measure by itself, not simply a proxy for personality (i.e. conscientiousness, etc.) or cognitive abilities. Furthermore, for individuals with lower to moderate wealth, financial self-awareness in earlier life is linked to higher accumulated wealth in later life. In sum, this study contributes to the literature by validating financial self-awareness as an important and separate measure from existing financial literacy measures, one that captures an important aspect of financial literacy not encompassed by the currently used measure, and documenting according to this measure what populations appear to lack financial self-awareness and therefore might be most in need of financial education, with the implication of providing well-targeted interventions promoting self-awareness throughout life to improve financial well-being in later years.

GENERAL INTRODUCTION

The retirement landscape in the U.S. has grown more complex over the past few decades. Workers and retirees are being asked to take on more responsibilities for managing their retirement income and financial well-being as retirement benefit policies shift over time from defined benefit plans to defined contribution plans. While Americans are increasingly left to save and invest in their own for retirements, there is considerable evidence that many Americans lack the capabilities to effectively complete this task. One third of adults in their 50s say they have failed to develop any kind of retirement savings plan at all (Lusardi, 2003). Fewer than half of older U.S. workers have even attempted to estimate how much money they might need in retirement (Lusardi & Mitchell, 2005). Surveys of financial literacy find that most respondents do not understand basic financial concepts, including topics such as bonds, stocks, mutual funds, compound interest, loans, and mortgages (Agnew & Szykman, 2005; Hilgert, Hogarth, & Beverly, 2003; Mandell, 2004; Moore, 2003; National Council for Economic Education, 2005). Consumers are also ignorant about Social Security and pensions, two of the most important components of retirement wealth (Benitez-Silva, Demiralp, & Liu, 2009; Chan & Huff Stevens, 2003; Gustman & Steinmeier, 2004; Mastrobuoni, 2005). The recent financial collapse reveals the possible consequences when consumers are ignorant about their financial situations and are passive about managing their financial lives.

In response to the acknowledgement that Americans are lacking the skills needed to effectively manage their financial lives, programs and initiatives have been developed to promote financial literacy and provide financial education to U.S. consumers. Most of

the interventions provided by the federal government and financial practitioners have focused on providing specific financial skills to specific subpopulations (Collins & O'Rourke, 2010; Lyons, Palmer, Jayaratne, & Scherpf, 2006). The empirically measured results from these different programs and populations have been generally positive, but small (Bernheim & Garrett, 2003; Bernheim, Garrett, & Maki, 2001; Collins & O'Rourke, 2010; Lyons, et al., 2006; Way & Ang, 2010). Furthermore, these studies are also only focused on short-term interventions and measure short-term outcomes (Collins & O'Rourke, 2010).

While targeted and short-term financial literacy initiatives have blossomed and have been the subject of research, there are several issues that remain unresolved. First, the term “financial literacy” has been used stochastically and excessively without a consensus regarding what it really means, or how gains in financial literacy will lead to greater financial security. Second, despite such educational efforts, we know little of the mechanisms contribute to greater financial capabilities, and what types of financial knowledge and behavior are most vital to good planning. Third and most importantly, is we do not know whether these education efforts make any difference in later life financial well-being.

In attempting to address these concerns, the purpose of this study is therefore three-fold, and is addressed in three separate yet closely related essays. In essay 1, the objective is to construct a new measure of financial “literacy,” which I term “financial self-awareness,” in an attempt to capture important aspects that are neglected by existing financial literacy measures. In this essay I first review the existing literature and evaluate the advantages and disadvantages of existing measures of financial literacy used therein.

Next, based on the framework of “implementation intention,” I propose a new measure: “financial self-awareness,” which is a form of implementation intention that represents a mindset of how one cares about his or her financial situation. This measure is derived from individuals’ knowledge of their own financial assets. It is intended to represent not only the general knowledge necessary for managing one’s financial life, but also to reflect financial behavior involving constant monitoring and being alert to one’s asset situation, itself a behavior subject to being followed over time. This is an issue I discuss in greater detail within essay 1. The implications of using this new “financial self-awareness” measure in considering public policy are discussed at the end of essay 1.

The purpose of essay 2 is to examine the correlates that contribute to higher financial self-awareness. Inspired by modified human capital theory that incorporates psychological human capital, using data from Wisconsin Longitudinal Study (WLS), I examine whether personality traits help explain variations in the level of financial self-awareness in late life. In particular, I put emphasis on exploring the role of personality traits and psychological characteristics in effecting financial self-awareness, whether they have direct effects on financial self-awareness, or as mediators in the relationship between cognition and financial self-awareness. Understanding the role of personality in the relationship between cognitive ability, which is evidently an awareness predictor, and financial self-awareness helps validate whether financial self-awareness is a distinctive measure or just a proxy for personality.

The purpose of essay 3 is to provide empirical evidence for the possible implications of being financial self-aware, in other words, whether financial self-awareness makes any difference to retirement well-being. Using the measure of financial

self-awareness developed in essay 1 and the WLS dataset, I examine the links between being financial self-aware in earlier life (1992/1993 data wave) on retirement well-being in late life (2003/2005 data wave), as measured by wealth accumulation. I hypothesize that individuals who are more financially self-aware in the ways I measure it, having a clear sense of their financial assets situation and paying attention to it, will, even if not extremely savvy about investment or financial markets accumulate higher levels of wealth over their lifetimes, resulting in higher accumulated wealth in late life.

In sum, combining all three essays, this study aims to provide a new measure: financial self-awareness, that captures an important aspect of financial literacy not represented by the currently used measure; to document, using this measure, what populations, in terms of cognitive and psychological human capital, appears to lack financial self-awareness and therefore most need financial education, with implications for generating interventions across individuals' life course to improve financial well-being in later life; and finally, to provide empirical evidence of how financial self-awareness matters to retirement well-being. A concluding chapter unites the findings from the three essays and presents the general conclusions and implications of the study. Insights as to directions for future research are also provided.

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ESSAY ONE: LITERATURE REVIEW AND JUSTIFICATION FOR THE CONCEPT OF FINANCIAL SELF-AWARENESS

Introduction

The retirement landscape in the U.S. has grown more complex over the past few decades. Workers and retirees are being asked to take more responsibility for managing their retirement income, and for their financial well-being, as retirement benefit policies shift over time from mandated defined benefit plans to voluntary defined contribution plans. Savings tools are being promoted fervently in both public and private sectors as a means to help individuals create sufficient savings to reach their financial goals. Traditional economic theory posits that forward-looking consumers maximize their expected utility and choose consumption and savings throughout their life cycle based on expected lifetime, economic resources and preferences. However, there is considerable evidence that many Americans are lacking both the capabilities to effectively save for retirement and to manage their income when in retirement. One third of adults in their 50s say they have failed to develop any kind of retirement saving plan at all (Lusardi, 2003; Lusardi & Mitchell, 2007a). Surveys of financial literacy find that most respondents do not understand basic financial concepts, including topics such as bonds, stocks, mutual funds, compound interest, loans, and mortgages (Agnew & Szykman, 2005; Hilgert, Hogarth, & Beverly, 2003; Mandell, 2004; Moore, 2003; National Council for Economic Education, 2005). Consumers are also ignorant about Social Security and pensions, two of the most important components of retirement wealth (Benitez-Silva, Demiralp, & Liu, 2009; Chan & Huff Stevens, 2003; Gustman & Steinmeier, 2004;

Mastrobuoni, 2005). Consequently, researchers, policy makers and practitioners have become increasingly concerned with the financial literacy of the U.S. population. Programs and initiatives have been developed to promote financial literacy and to provide financial education to various subpopulations.

However, the term “financial literacy” has been used stochastically and excessively without a consensus of what it really means, or how gains in financial literacy will lead to greater financial security. Different researchers and organizations have defined and measured financial literacy in many different ways (Huston, 2010). These discrepancies create several problems. From a theoretical standpoint, financial literacy studies may reach mixed conclusions on the determinants and consequences of financial illiteracy due to inconsistency in definitions and measurements. Perhaps more importantly, from a practical standpoint, such discrepancies may jeopardize the effectiveness of financial education programs. Without a clear sense of what financial literacy is and how to measure it, one can hardly hope to develop an effective educational program. If the focus is on individual program design, what is meant by “financial success” must be clearly defined, with a precise target audience in mind and a good understanding of what types of knowledge should be delivered in order for the efficacy of the program to be judged. Furthermore, definitional discrepancies also pose problems when evaluating and comparing financial education programs, due to the lack of standardized, nationally applicable benchmarks and measurements (Fox, Bartholomae, & Lee, 2005; Lyons & Neelakantan, 2008; Lyons, Palmer, Jayaratne, & Scherpf, 2006; Lyons & Scherpf, 2004; U.S. Government Accountability Office, 2004). In sum, there is an impending need to develop better measures of financial literacy in order to evaluate

the effectiveness of current interventions, develop new ones, and examine the consequences of financial illiteracy on financial well-being.

The purpose of this essay is to first outline the definitions of financial literacy that have been adopted in various studies, and then to discuss how the concept has been measured. A great deal of variation exists in how researchers and organizations have defined and measured financial literacy (Hung, Parker, & Yoong, 2009). Though the measures of financial literacy employed have varied considerably, they broadly fall into two groups, knowledge-based and behavior-based measures. I discuss these categories in more detail from two: financial literacy as a “knowledge-based” concept and financial literacy as a “behavior-based” concept. Moreover, I argue for a third, but not entirely unrelated, perspective: financial literacy should be understood as a dynamic concept, with the premise that what we need to know to be effective at financial management changes over time. It is not necessarily that financial literacy has become more important over time, but that the skills required in order to be financially capable change both with age and with economic environment. There must be a certain aspect of financial literacy that represents more general skills, a mindset that can be built upon and can benefit individuals over time. Thus, I propose an innovative measure of financial literacy – “financial self-awareness” developed using the Wisconsin Longitudinal Study (WLS), which ideally combines and addresses the three aspects mentioned above – knowledge, behavior, and dynamics, which will be used in the following two empirical essays of this dissertation. In this essay I explain why financial self-awareness should be considered a unique measure differing from existing measures of financial literacy, and discuss how it can adequately capture financial literacy. Discussions of how this measure is employed in

the following essays and its further implications for financial education programs conclude this review piece.

Literature Review

What is Financial Literacy?

Financial literacy as a “knowledge-based” concept. The prevalent approach of measuring financial literacy has been to develop explicit “financial knowledge” questions (Lusardi, 2008; Lusardi & Mitchell, 2005, 2007a; Mandell, 2007; National Council for Economic Education, 2005), ranging from knowledge of basic financial concepts, basic economic principles, financial instruments, to understanding of the U.S. economy. This approach to measuring financial literacy assumes that if consumers have basic “tools,” presumably knowledge, they can use them to make better financial decisions. For example, a report by the National Association of State Boards of Education (NASBE) argued that financial education is like other types of education, in which teaching the basics helps to develop the building blocks individuals need to make good financial decisions throughout their lives (National Association of State Boards of Education, 2006). Indeed, it is widely accepted that having knowledge regarding budgeting, investment, and credit management are prerequisites for making good financial decisions (Hilgert, et al., 2003). The fact that knowledge is more easily detectable in a short period of time also makes it a more desirable measure than behavior for testing purposes.

Some institutional definitions for financial literacy have been coined with this knowledge-based view in mind. The National Council on Economic Education (NCEE) defines financial literacy as “*familiarity* with basic economic principles, *knowledge* about

the U.S. economy, and *understanding* of some key economic terms,” a definition which emphasizes the knowledge perspective (2005). A more specific view is offered by the Financial Industry Regulatory Authority (FINRA), which defines the concept as: “the *understanding* ordinary *investors* have of market principles, instruments, organizations and regulations,” with investment markets in mind (2003).

One of the most widely referenced studies of financial literacy is the biennial, national Jump\$tart’s Survey of Financial Literacy Among High School Students. The Jump\$tart Surveys serve as a classic example of viewing financial literacy as a knowledge-based concept. The creator of the Jump\$tart Survey, Lewis Mandell, defines the term as: “the ability to evaluate new and complex financial instruments and make informed judgments in both choices of instruments and extent of use that would be in their own best long-run interests” (Mandell, 2007). The Jump\$tart survey tests how savvy high school students are about income, money management, saving and investing, and spending and credit. For example, one of the survey questions tests whether the respondent knows that a credit card holder who only pays the minimum amount on monthly card balances will pay more in annual finance charges than a card holder who pays their balance in full. Another question tests whether respondents know that stocks are likely to have higher average returns than savings bonds, savings accounts and checking accounts *over an 18 year period*. Survey results show the test scores have been deteriorating over the years and the 2008 Jump\$tart survey showed that 73.9% of 12th grade respondents “failed” the test, using a “failure” threshold of answering 59% or fewer questions correctly. On average, high school seniors correctly answered only 48.3 percent of the questions (Mandell, 2008). The results over the years have been used as evidence

of low financial knowledge among high school seniors, and as an indicator that nationally, young people are inept in managing their personal finances.

However, there are numerous critiques regarding the validity and reliability of the survey and whether policy makers and researchers should rely on the results from the survey in formulating financial literacy policies. A critique by Lucey (2005) summarizes the problems well, and points to a broader problem with the financial knowledge approach used by most large-scale financial literacy tests. Lucey compared the JumpStart 1997 and 2000 survey for assessing the reliability and validity of the survey instruments. First, he concluded that the items on the surveys did not cover all the benchmarks set by the JumpStart Coalition, and therefore suffered from the problem of low content validity. Smaller-scale financial literacy tests with fewer questions would also easily encounter this same problem. Second, the JumpStart surveys are unable to capture certain behavioral evidence of good financial behavior, beyond what the respondents know about personal finance. This reveals a potential problem with many knowledge-based financial literacy surveys. Evidence can be found in studies showing inconsistency between test results and real behaviors. An example provided by Mandell (2005) found that students who have taken personal finance classes scored lower on the JumpStart test, but reported higher levels of thriftiness than their peers. He therefore hypothesized that the classes increase savings without increasing literacy. Other evidence also suggests that individuals might present sound financial behavior without receiving high scores on financial literacy tests. While Bernheim, Garrett, and Maki (2001) found that individuals in states with high school financial curriculum mandates have higher savings, a subsequent study by Tennyson and Nguyen (2001) found that students in the majority of states with such

mandates had scores on tests of financial knowledge and skills no greater than students in states without mandates. Bernheim and colleagues provided a possible explanation for these seemingly conflicting results by conjecturing that the increased savings rate was not due to increased financial knowledge or skills, but to “increased comfort with financial transactions and concepts” resulting from the mandated classes. Courchane and Zorn (2005) came to a similar conclusion about a causal link between financial education and improved financial behavior unrelated to literacy test results. This conjecture helps to stress the point that it might be problematic to judge financial capability using results from financial literacy tests alone. Perhaps a broader measure of financial literacy, which includes positive financial behavioral changes as an output measure, should be utilized in survey design in order to better reflect financial capability.

Omitted by Lucey, another validity issue might occur with the grading scale (i.e. the percentage of correct answers) and failing standard (i.e. a score of less than 60 percent) used by the Jump\$tart survey. These scales are used by schools in parts of the nation for other high school tests. However, they might not be appropriate for this particular survey, which covers a wide range of questions involving different levels of financial sophistication. Moreover, total scores are not good indicators if survey questions are misleading or poorly stated, which sometimes might be the case in financial literacy surveys (Lerman & Bell, 2006).

Besides validity and reliability problems, social bias is a common problem with knowledge-based surveys. Lucey (2005) presented statistical evidence of cultural and educational biases in questions, that is, middle and upper socioeconomic class students recognized certain topics better than lower socioeconomic class students simply because

they were more familiar with certain concepts (due to more exposure to associated topics), which need not relate to actual practice differentials. Findings by Chen and Volpe (1998) imply a similar problem. Using survey tests to measure personal financial literacy among college students, they argued that students were most likely to correctly answer questions about financial issues that were most familiar to them, for example auto insurance and apartment rent, but not questions on other subjects. Indeed, in order to understand whether individuals have poor knowledge for the financial situations they face now or are likely to face in the near future, one would need information on what individuals “need to know.” The truth is, most financial literacy tests lack applicability to the socioeconomic groups they are actually testing, therefore fail to reflect levels of “need to know” knowledge.

In empirical studies, knowledge-based measures for assessing financial literacy have only recently been included in major secondary data sets. These measures include things such as whether individuals can calculate compound interest or know the difference between a stock and a bond (Hilgert et al., 2003; Lusardi & Mitchell, 2005, 2007a, 2007b, 2007c, 2008, 2009; Moore, 2003). Lusardi and Mitchell defined financial literacy as “familiarity with the most basic economic concepts needed to make sensible saving and investment decisions” (Lusardi & Mitchell, 2007c). A major part of their literature relies on a common approach, which is to use a 3-item test that assesses respondents’ knowledge of compound interest, inflation, and risk diversification, and to take the percentage of correct answers as a measure of individual’s financial literacy level (Lusardi & Mitchell, 2005, 2008, 2009). They found that financial literacy and planning are interrelated: those who displayed more financial knowledge were more likely to have

planned and succeeded in their planning (Lusardi & Mitchell, 2005). In addition, planners arrive close to retirement with much higher wealth and display higher financial literacy than non-planners (Lusardi & Mitchell, 2007a). Albeit informative, the results of the 3-item literacy measures still suffer from the potential validity issues evoked above, notably, whether a true financial literacy concept can be captured in 3 questions.

As a variant of the knowledge-based measurement, a few studies utilize “perceived” knowledge as one of their measurements. The survey question usually asks, “how much do you think you know?” to assess respondents’ confidence in their knowledge of financial concepts and instruments. Whether perceived knowledge is an appropriate proxy for actual knowledge is debatable. Agnew and Szykman (2005) found only moderate correlations between actual and perceived financial knowledge, whereas Lusardi and Mitchell (Lusardi & Mitchell, 2007b, 2009) and Van Rooij, Lusardi and Alessie (2007) reported strong correlations between the two. Among the groups exhibiting correlations between the actual and the perceived, they also found that perceived knowledge had predictive ability for retirement planning behavior on its own, independent of the effect of actual knowledge. Those who claim they are knowledgeable about economics are more likely to plan for retirement and to participate in the stock market (Lusardi & Mitchell, 2007b, 2009; Van Rooij et al., 2007). However, there has not been much attempt yet to compare marginal predictive power when considering both actual and perceived knowledge simultaneously. Clearly, even within the knowledge dimension, one should account for multiple aspects of financial literacy, instead of relying on one specific measure.

More recent studies have noticed potential problems raised by using knowledge-based financial literacy measures, including that recognizing knowledge relevant to behavior is what really matters. To be sure, there do exist studies examining the validity of the knowledge-based measures by using them to predict behaviors such as retirement savings, participation in pension plans, levels of financial debt, or portfolio choices. Lusardi and Mitchell used data from the RAND American Life Panel (ALP) to come up with a financial literacy index derived from both basic and sophisticated literacy questions (Lusardi & Mitchell, 2007b, 2009). The newer dataset allowed them to evaluate financial knowledge during workers' prime earning years, when they are making key financial decisions, a feature useful in addressing the dynamic nature of the literacy measure. It also included both objective measures and self-assessed measures of financial literacy, to reflect the difference between what people know and what they think they know. The studies concluded that the financial literacy index is a strong predictor of the simplest form of retirement planning (i.e. the extent to which one thought about retirement), and that indexed literacy is higher when respondents were exposed to economics in school and to company-based education programs. While the financial literacy index attempts to cover more aspects of financial literacy, literacy is still treated as a separate concept from behavioral measures and only served as a predictor of the simplest form of retirement planning behavior. It lacks the ability to predict or accommodate other behavioral outcomes at different life stages.

In Lusardi and Tufano's study (2009) on debt literacy, knowledge about debt was defined as a component of financial literacy, and referred to "the ability to make simple decisions regarding debt contracts, in particular how one applies basic knowledge about

interest compounding to everyday financial choices.” Debt literacy was measured using questions testing knowledge of fundamental concepts related to debt and by self-assessed financial knowledge. On the contrary, financial experiences were behavioral measures based on participants’ reported experiences with traditional borrowing, alternative borrowing, and investing activities. They found a strong relationship between debt literacy and both financial experiences and debt loads. Specifically, individuals with lower levels of debt literacy tended to transact in high-cost manners, incurring higher fees and using high-cost borrowing. The less knowledgeable also reported that their debt loads were excessive. Although the study implied the need to link the knowledge and ability aspects of financial literacy, it focused only on debt-related knowledge and experiences.

In short, the premise that motivates research of financial literacy as a knowledge-based concept is that knowledge matters to individuals making their own decisions as a means to meet their goals, especially in today’s environment, where savings decisions are increasingly left to individuals. Financial literacy advocates should be advocating knowledge rather than financial regulations or dependence on advisors. However, current “knowledge-based” financial literacy tests and financial literacy survey questions fail to serve as a stand-alone measure for financial capability due to the way they measure—with explicit and limitedly focused questions, and testers’ presumption of what financial literacy should be. It should be noted that what matters, presumably, is knowledge relevant to behavior. Behavioral measures and dynamic consideration must be incorporated in order to constitute an adequate proxy of financial capability.

Financial literacy as a “behavior-based” concept. Alternatively, measures for financial literacy can be action based, measuring whether individuals exhibit good financial behaviors (Moore 2003; ANZ Bank 2008). The President’s Advisory Council on Financial Literacy (PACFL, 2008) defines financial literacy as “*the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial well-being,*” hence hinting the behavioral facets of the concept.

Some studies recognize the importance of behavioral aspects of financial literacy by linking financial knowledge and financial decision-making. For instance, a study by Hilgert, Hogarth & Beverley (Hilgert et al., 2003) calculated financial knowledge scores (i.e. financial IQ), to reflect respondent’s understanding of credit management, savings, investment, and mortgages. Although not explicitly stated, the study implies the financial IQ is an indicator of financial literacy. Meanwhile, they asked households to report the financial practices they engaged in over a month, including cash-flow management, credit management, saving activity, investment, and other financial experience. They examined the link between financial knowledge and financial practices, concluding that those who knew more were more likely to engage in financial practices, with the caveat that certain types of knowledge were significant for particular practices. Other research shows that financially unsophisticated households, as measured by literacy test scores, are more likely to avoid the stock market (Van Rooij et al., 2007; Kimball and Shumway 2007). These studies provide insights as to how behavioral patterns may be incorporated into the financial literacy concept by linking literacy test scores to explicit financial behaviors.

Unlike empirical research utilizing knowledge-based measures of financial literacy, most empirical research that incorporates behaviors also attempts to measure knowledge. For instance, the survey by Moore (2003) reports on financial literacy status in Washington State; she posits that literacy is obtained through practical experience and active integration of knowledge, therefore individuals are considered financially literate if they are competent and can demonstrate they have used knowledge they possess. To measure the concept, Moore included numerous aspects of financial literacy, including knowledge, behavior, experiences, and debt confidence. While knowledge was measured using conventional survey questions covering topics including credit cards, mortgage, and investment, the other three aspects were measured using a self-report method. Scores or indices were devised for knowledge levels, experience levels, positive and negative financial behaviors. The study demonstrated that the more financially knowledgeable had significantly more diverse financial experiences and exhibited more protective behaviors than the “victim pool” consisting of victims of predatory lending practices. The financially literate were more likely to have invested in the stock market, saved for long term financial goals, diversified their investments, put money into retirement plans such as IRAs or other investments and prepared a long term financial plan, whereas the financially unsophisticated selected less advantageous mortgages. Though the study is exploratory, it provides the most comprehensive measurements for financial literacy thus far utilized in empirical research.

Another national financial literacy survey which aimed to integrate various aspects of financial literacy was conducted by ANZ Bank in Australia. It defined the concept as: “the *ability to make informed judgments* and to take effective decisions

regarding the use and management of money.” Operationally, financial literacy scores were generated by calculating a summary score drawn from 26 questions on the survey, which intentionally covered areas including numeracy, financial understanding and competency, and financial responsibility. Besides looking at the distribution of financial literacy scores demographically, the study also examined the relationship between financial literacy scores and particular behaviors, attitudes, and consequences thereof.

To summarize, efforts have been made to cover multiple aspects of financial literacy, either by relating the knowledge aspect to behavior aspects, or by providing multiple measures for various aspects. Generally, however, the measures themselves do not overlap and cannot capture both financial knowledge and the ability to use that knowledge. A consolidated measure that can capture both the knowledge and behavior aspects of financial literacy, which also takes into account the dynamic nature of financial literacy, is needed.

Financial literacy as a “dynamic” concept. The President’s Advisory Council on Financial Literacy (PACFL, 2008) defines financial literacy as “*the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial well-being.*” This definition implies the intention to capture the dynamic aspect of financial literacy, with the notion of “a lifetime of financial well-being.” It does not necessarily mean that financial literacy has become more important over time, just that the skills required may have changed. For instance, the cohort already stepping into retirement was probably very skilled in balancing a checkbook, which was a very important skill with savings or bank accounts during their major earning years, however

they might not be as skilled now, given that everything is done online and that recommendations regarding their portfolio composition have changed. Another dramatic difference is the bursting development of various financial products in the last two decades (Litan, 2010). One would need to know a different set of financial rules in order to be financial literate in different point in time. One compensation method would involve using a more time-relevant financial literacy measure, for example, things respondents need to know/do around the time of interviews, if using survey data. Say the target group is of retirement age; measuring knowledge of pension assets would be more valuable than measuring numeracy level.

Some studies, while still focusing more heavily on the knowledge aspect of financial literacy, have taken the dynamic characteristics of “need to know” knowledge into consideration. One group of studies revealed that consumers close to retirement age are ignorant about Social Security and pensions (Benitez-Silva, Demiralp and Liu, 2009; Chan and Huff Stevens, 2003; Gustman and Steinmeier, 2004; Mastrobuoni, 2005). These studies looked at how well consumers understood the governing rules of Social Security and pension benefits, and examined whether understanding of the rules affected retirement welfare. Chan and Huff Stevens (2003) found that well-informed individuals are five times more responsive to pension incentives than the average individual when pension knowledge was ignored. Another study, by Benitez-Silva and colleagues (2009), analyzed how much people know about the Social Security rules and then assess the consequences for individuals of the apparent prevalence of ignorance about the rules. Using a realistic and empirically-based life-cycle model of retirement behavior under conditions of uncertainty, they compared welfare outcomes in scenarios of incomplete

information and unawareness, and outcomes under full information, concluding that there are welfare gains resulting from the acquisition of information regarding the Social Security system. This research, however, limits its scale of knowledge measurements to retirement income only.

An alternative method for capturing the dynamic nature of financial literacy would involve using measures that can be applied to all life stages, and are considered to be quintessential to financial well-being at all times. There have been studies that examine the relationship between cognitive abilities, particularly numeracy, and economic behaviors or outcomes (Banks & Oldfield, 2007; Christelis, Jappelli, & Padula, 2006; Cole & Shastry, 2009; McArdle, Smith, & Willis, 2009). Nevertheless, previous studies have not been able to further explore the possible mechanisms operating among these more general capabilities and economic outcomes, in particular the role played by financial literacy. None of these studies has situated its discussion in the context of exploring the dynamic characteristics of financial literacy, which implies that this kind of financial literacy can withstand over time and help guard against challenges at various life stages.

Thus, the review of previous research demonstrates that existing measures of financial literacy are at best a means to an end, each with values and shortcomings in reflecting individuals' true financial capability to manage their financial lives. The most prevalent knowledge-based measures are relevant for understanding financial capabilities, insofar as they are presumed to be tools that lead to better financial outcomes and can be conveniently measured. However, the broader validity of knowledge-based measures is jeopardized by at least two problems. One is that the results may be

confounded by the potential bias of literacy tests, which employ explicit and fairly narrowly focused questions, and the areas are selected for measurement, which may be irrelevant for some individuals or limited to a particular point in time when the tests are taken. This can lead to misleading results and policies. Secondly, and also more profoundly, the lack of behavioral evidence is another problem plaguing knowledge-based measures. Financial knowledge is assumed to lead to good outcomes, but need not do so. Individuals may have performed exceptionally well on existing financial literacy tests and yet still failed to make sensible financial decisions with consequences in mind. Alternatively, individuals may have performed badly on financial literacy tests and still have been coping well financially.

On the other hand, behavioral-based measures are viewed as proof of what and how consumers realize their financial capabilities to be. Nevertheless, individuals who behave in appropriate ways do not necessarily understand the causes and consequences of financial illiteracy, or why they should behave the way they do. Mandates, defaults, and having others manage one's finances might help to achieve socially expected results in a financially illiterate world. From a practical point of view, behavioral results usually require time lags, and therefore are more difficult to observe. Under some circumstances, behavioral outcomes might not be observed at all depending on time of observance and personal situations. For example, one should not judge a person's financial literacy level simply by asking "whether you have opened bank accounts or not," since some individuals might not be in a financial position to open and maintain a healthy account. More importantly, behavioral-based measures and knowledge-base measures alike suffer from the fact that these measures are clearly driven by "expected" behaviors and

“expected” answers and thus may reflect the testers’ goals more than the test takers’.

Researchers are usually paternalistic in saying that someone is “financial literate” only if they behave in certain ways and answers the survey questions with specific answers.

Lastly, if the dynamic nature of financial literacy is omitted, the picture gathered by any financial literacy measure might not tell the true story of an individual’s ability to manage his or her financial life. For example, today, an individual knows all about defined contribution plans, private investment accounts and the nuances of Social Security Policy. But in 30 years, policy and employment changes may create requirements for a very different set of skills. If the individual does not have in their mindset to diligently care for his or her financial situation, he/she might not be able to learn new skills and keep up with an ever-changing financial context.

In sum, financial literacy involves complex phenomena that encompass knowledge, behavior and dynamic aspects. In this dissertation it is proposed that a comprehensive, time sensitive, and consolidated measure that considers all three aspects of financial literacy and supplements existing measures is needed. A comprehensive measure should reflect all three aspects: knowledge, behavior and the dynamic nature of financial literacy; a time sensitive measure is based on the premise that what we need to know to be effective in our financial lives changes over time. These concepts can, and need to be captured and consolidated into one holistic measure.

The Proposed New Measure – Financial Self-Awareness

I propose a term called “financial self-awareness,” the intention of which is to capture the knowledge and behavioral aspects of financial literacy, with a dynamic point

of view. In short, “financial self-awareness” attempts to capture an individual’s knowledge of his or her own financial situation at a given point in time. It reflects the efforts an individual has made to be precise and active in their financial life, which almost gets at one’s mindset of whether one is able or has chosen to stay on top of one’s financial situation. In what follows, I first define what “financial self-awareness” is, and how it distinguishes itself from existing financial literacy measures. Furthermore, I explain why financial self-awareness is important to achieving financial well-being by adopting existing relevant theories and providing the conceptual framework used for the empirical studies in essay 2 and essay 3.

What is financial self-awareness? Financial self-awareness measures how knowledgeable individuals are regarding their own assets, their retirement savings, and their immediate financial resources. The purpose of focusing on “self” awareness is to turn the attention/awareness regarding financial issues inward. Unlike previous knowledge/behavioral measures of financial literacy focusing on outside standards, for example, how knowledgeable individuals are regarding specific financial instruments, or certain financial concepts; or how many experiences individuals have in financial markets, self-awareness would measure behavior without the “normative” aspect of what individuals should be knowing/doing to be “financially literate.”

Further, unlike a more general knowledge-based measure, financial self-awareness gets at a special kind of knowledge individuals require to manage their own finances. It measures not only knowledge, but reflects behavior as well. This responds to one of the controversies, discussed in this paper, about the appropriate measures of

financial literacy—is it about knowledge, which may never be activated, or about behavior that achieves the literacy goals? The proposed measures reflect the efforts individuals have made to be precise and active in their financial lives, which implies the degree to which they find it important to understand their financial situation. There are likely many well-educated individuals who can describe the difference between a stock and a bond, but cannot say how much they have in their checking accounts. There are likely many who formally understand compounding interest, yet, even on the verge of retirement, do not know how much their pension will be worth. That said, of course having complete knowledge of one's existing financial situation does not guarantee good financial decisions. Individuals may know they have very low assets relative to their debt and still overspend, for example, or may know about their debt precisely because they have overspent in the past. One could argue, however, that these are still more financially knowledgeable individuals. And, one could also argue, it is nearly impossible to make good financial decisions if one is not cognizant of one's basic financial resources.

The concept of financial self-awareness also reflects the dynamic quality of financial literacy. Since financial awareness is measured by knowledge of financial entities, it can reflect life cycle related changes in what it is individuals need to know. One might need to be financial literate about different sets of financial matters at different stages in life. On the other hand, financial self-awareness, as measured by a summary measure of knowledge of financial entities can represent a general mindset that individuals equip and sustain, so that being financially self-aware earlier in adulthood may help guard against financial challenges along the way, and thus contribute to better financial well-being in later life. Longitudinal data have always asked respondents about

financial matters in multiple waves, and I propose that responses to these questions are themselves good measures of financial self-awareness that can reflect the dynamic nature of financial literacy.

It should be noted that the purpose of adopting the concept of awareness is not to use “awareness” to predict wealth. Nor is it meant to replace existing financial literacy measures. Rather, the purpose of introducing the concept of “financial self-awareness” is to evaluate whether it is a good supplementary measure of financial literacy to complement existing ones. The existing knowledge-based measures capture how much consumers know about specific aspects of the financial world, whereas existing behavioral-based measures capture what consumers have done or experienced financially. These are perfectly valid and valuable measures of financial literacy under specific circumstances, when there are explicit knowledge and behaviors in mind to be tested, or when the purpose of testing involves evaluating the effectiveness of particular intended goals pursued by a financial course’s content. These are circumstances in which the financial self-awareness measure would be of no use. On the other hand, existing measures capture only limited aspects of financial literacy, and lack the ability to capture its dynamic nature. This measure of financial self-awareness indicates the ability to come up with an answer to the asset value question that requires continuous attention and diligently pay attention to one’s financial situation; it measures how well you know where you stand financially at a given point in time. Thus the degree to which one can answer asset value questions reflects a mindset of caring about financial status and is a precursor for pursuing further financial goals. Therefore, financial self-awareness is a comprehensive measure that incorporates knowledge, behavior, and dynamic aspects that

can capture the more complex nature of financial literacy, and may also potentially be more applicable when examining financial literacy among a diverse group of individuals. If the empirical results show that financial self-awareness correlates with wealth increase, this would provide evidence to validate this new measure of financial literacy.

Theoretical Framework

I proposed that financial self-awareness can very well be viewed as a form of implementation intention, and as with any well-structured implementation intention, financial self-awareness can facilitate the achievement of the ultimate goal of wealth accumulation. Implementation intentions are simple if-then plans that link situational cues with responses that are effective (“If situation Y arises, then I will initiate behavior Z”), and able to bring one closer in attaining ultimate goals or desired outcomes. In some cases simply asking people to develop such a plan, or an “implementation intention,” is all that is necessary to trigger an association between the desired behavior and a concrete future moment. A prompt to form an implementation intention is similar to a “nudge” in the direction of desired behavior (Thaler & Sunstein, 2008). Financially self-aware individuals are in a way “prompted,” presumably able to detect a pattern of overspending relatively early, and find it relatively easy to correct. Those with a financially self-aware mindset are also more likely to seize the opportunities to create more wealth. Therefore, it is hypothesized that financial self-awareness is a form of implementation intention that links situational cues (i.e., warning signs of overspending, good opportunities to act) with responses that are effective for attaining goals or desired outcomes, such as wealth accumulation.

Implementation Intention Theory

My hypothesis that monitoring and being aware of one's financial situation may aid in the achievement of a long-term goal such as wealth accumulation has an important precedent in the psychological literature. Psychologist Peter Gollwitzer first coined the term "implementation intention" in 1999 (Gollwitzer, 1999), and since then the concept has been tested and shown to significantly improve one's chances of successfully forming a new habit or reaching a goal, especially in the health behavior arena. Gollwitzer outlined a general vision of decision-making in which planning, even in its simplest form, is crucial to the achievement of long-term goals. To summarize, implementation intentions are simple if-then plans that link situational cues (i.e., good opportunities to act, critical moments) with responses that are effective and able to bring one closer to attaining ultimate goals or desired outcomes ("If situation Y is encountered, then I will initiate behavior Z in order to reach goal X!"). Implementation intentions are subordinate to goal intentions, and are formed for the purpose of enhancing the translation of goal intentions into action. The main idea is that intention realization can be promoted by forming if-then plans that enable people to deal effectively with self-regulatory problems that might otherwise undermine goal striving. As Gollwitzer indicated in his publication, "My colleagues and I believe that planning helps to alleviate crucial volitional problems of goal achievement, such as being too easily distracted from a goal pursuit or giving up in the face of difficulties when increased effort and persistence are needed instead" (Gollwitzer, 1996, p. 287). Utilizing simple, formed, if-then plans to implement goals should be efficient, given that pre-deciding how to implement one's goals in a given situation makes the process automatic, thus demanding fewer cognitive efforts. The

automatization of goal implementation should not only be useful in seizing good opportunities, but should also help a person protect goal pursuit from potential hindrances. Accumulated evidence indicates that if-then plan formation promotes effective management of various problems in goal striving and increases rates of goal attainment (Gollwitzer & Sheeran, 2006; Webb & Sheeran, 2008).

One of the reasons that implementation intentions should work in helping individuals achieving their goals is that implementation intention heightens awareness of obstacles and opportunities on the way toward the goals. Creating personal implementation intentions forces individual to brainstorm and plan for the critical situations that will come up along the path to one's goal and how one will respond to those situations. This exercise heightens one's awareness of the threats and opportunities that arise each day, helping one identify moments when one needs to take action. This mechanism provides a good explanation of how implementation intention links to financial self-awareness measures, which I explain in the following section.

Financial Self-Awareness and Implementation Intention

Financial self-awareness as defined in this dissertation represents a conscientious and mindful mindset that reflects the degree to which an individual cares about his/her own financial situation. Financial self-awareness helps individuals to recognize situational cues of potential financial difficulties and opportunities that might arise in the financial environment by way of monitoring and constantly paying attention to one's financial situation. It is analogous to the situation that in order to form an implementation intention, the person must identify a critical cue to initiate the behavioral response, and

make the mental link between the critical cue and the behavioral response. Financial self-awareness reflects a mindset that heightens the accessibility of the situational cues (the if-part of the plan), meaning that individuals are in a good position to identify and take notice of the critical cues when they subsequently encounter it, may it be obstacles (e.g. a huge amount of credit card debts) or opportunities (e.g. a bull stock market). Once the situational cues are identified, they will automatically trigger subsequent desired behaviors leading to better financial well-being, measured by accumulated wealth in this study. Subsequent desired behaviors could be putting a halt to overspending, or taking advantages of investment opportunities, or allocating funds efficiently among different assets or within portfolios. Being fortified with financial self-awareness enables the enactment of this if-then plan, and this fortifying is most effectively done by having knowledge of funds one owns and categories among which funds can be allocated or not spent.

Therefore, operationally financial self-awareness is measured by the extent to which an individual knows about the values of his or her own assets in this study. Three indicators are used in this study to capture this financial self-awareness concept: 1) The percentage of asset categories that respondents are able to provide values for – which is intended to capture the respondent's level of awareness of his or her current financial situation; 2) the ability to provide the value of one's bank accounts, an asset that is likely the most immediate to day-to-day financial transactions; and 3) the ability to provide the value of one's retirement savings accounts, an asset important to life-course planning for the sample used in this study. The first measure of percentage of asset categories is intended to capture the degree of self-awareness that enables the type of if-then

adjustments to cues, while the other two measures each captures financial self-awareness among individuals of assets that are potentially most important to individuals in this type of readjustment process. Knowing the values of one's own assets reflects the alertness and the ability to detect early signs of problems and opportunities, thus could be viewed as an implementation intention, which will then trigger desired behavioral outcomes. Knowing the values of one's own assets itself probably does not help much in accumulating more wealth or preserving wealth. It is the realization of knowing the values that reflects an implementation intention, which will in turn enact behavioral responses, including further financial planning, which might facilitate wealth accumulation. It is the financially self-aware mindset being reflected by the knowledge of asset values that is important, not the knowledge of asset values itself per se.

Using “whether respondents know about the value of a particular asset owned” or “the percentage of asset categories that respondents can provide values for” as indicators are only two ways to capture the concept of financial self-awareness. Other measures of financial knowledge such as knowing the composition of the investment portfolio, and knowing what types of assets are including in the asset holdings, might very well be able to capture other aspects of one's financial self-awareness level. Different measures might be adopted to capture the same concept of financial self-awareness if using different datasets. However, the self-awareness measures used in the current study are the most straightforward ways, given the data available in the Wisconsin Longitudinal Study, to operationalize the theoretical concept of financial self-awareness as described above.

Financial Self-Awareness and Wealth Accumulation

Thus, the central research question for essay 3 is: given that consumers have certain types of financial assets, does attentiveness/alertness to one's financial situation, i.e., how much attention ones pay to one's assets, or how much effort one makes to monitor assets make any difference in financial well-being in late life, as measured by accumulated wealth. As stated, it is hypothesized that financial self-awareness in earlier life can be viewed as a form of implementation intention, which is formed through effortful self-control. Once financial self-awareness is formed it will automatically activate productive financial behaviors and ultimately lead to better financial well-being in later life, measured according to accumulation of wealth. If one's ultimate goal is achieving a certain wealth level in later life, individuals who equip themselves with financial self-awareness, i.e. a form of implementation intention, should be more likely to detect obstacles (e.g. "I had too much credit card debt last month!" – the "if" part - "I need to cut down my apparel expenses next month." – the "then" part), and/or opportunities (e.g. "The stock market performed well recently" – the "if" part – "I should locate more of the funds in my retirement account to stock funds." – the "then" part) toward accumulating wealth and being more financially prepared for their retirement years. Being aware of one's own financial situation requires knowledge of one's assets, which represents the "knowledge" component, and constantly paying attention attentively to improve or maintain the situation – which represents the "behavior" component, and is hypothesized to be linked to financial well-being in later life.

The view of financial self-awareness as a form of implementation intention also provides support for the argument concerning the relationship between financial self-

awareness and psychological human capital, such as personality traits and psychological orientations, which I empirically test in essay 2. Implementation intentions are self-regulatory tools that delegate conscious and effortful control of goal-directed behaviors to automatic control by selected situational cues. Implementation intentions therefore can facilitate goal attainment by addressing the self-regulatory problems that beset a person's goal striving, such as problems with getting started and being derailed along the path. With regards to financial self-awareness, as a form of implementation intention, it reflects certain self-control skills acquired by continuously and diligently paying attention to one's financial situation, monitoring one's financial assets carefully, and actively engaging in one's financial affairs. Personality traits that capture a sense of control, a willingness to learn and try new things, and a tendency to plan and remain a proactive attitude are expected to influence self-regulatory skills. For instance, a neurotic personality (indicating a lack of sense of control) might be negatively related to financial self-awareness, whereas conscientiousness might be positively related. In essence, financial self-awareness represents a mindset of willing to care for one's own financial situation through self-control, self-regulatory and simple planning abilities, which might very well be linked to personality traits and psychological orientations that capture these characteristics. Therefore, personality traits and psychological orientations are hypothesized to be potential determinants of implementation intentions, in this case financial self-awareness. In essay 2 I integrate this concept of implementation intention with human capital theory. Psychological human capital is integrated into the discussion of the links between human capital and financial self-awareness. The formation of financial self-awareness demands cognitive human capital, like the formation of other

implementation intentions. Meanwhile, psychological human capital is expected to affect financial self-awareness. It is hypothesized that personality traits and psychological orientations can help explain variations in the level of financial self-awareness, and potentially mediate the relationship between cognitive human capital, such as early life cognition, education and school experiences, and financial self-awareness.

It is worth to mention that there is related literature that captures a similar concept that I describe as financial self-awareness. Ameriks and colleagues (Ameriks, Caplin, & Leahy, 2004) developed a model to capture “absent-minded” consumers who choose not to monitor their spending at all, and further found that absent-minded consumers tend to consume more than attentive ones due to “precautionary spending.” The “absent-mindedness” in their study resembles a lack of financial self-awareness in the current study. Both absent-mindedness and the lack of financial self-awareness describe the fact that individuals fail to monitor and pay attention to their financial matters. Nevertheless, financial self-awareness differentiates itself from absent-mindedness in several ways. First, my proposed measure of financial self-awareness intends to capture asset status, which covers both aspects of consumption (outflow) and income plus savings (inflow); in contrast, Ameriks and colleagues’ “absent-mindedness” focused on current consumption flow. Second, while both studies recognize the importance of self-regulatory behaviors such as monitoring and budgeting, my financial self-awareness framework sees monitoring as preceding requirements when forming the implementation of intention, while Ameriks and colleagues viewed monitoring and/or budgeting as a means of reducing the uncertainty of consumer’s past spending. Therefore, while it is intriguing to

see the analogies between the two concepts, the current study deploys a distinct theoretical framework and findings.

Approach and Data

This study uses data from the Wisconsin Longitudinal Study (WLS), a panel study of a random sample of 10,317 men and women who graduated from Wisconsin high schools in 1957, and who were interviewed in 1964, 1975, 1992 and 2004. The cohort was born in and around 1939, making them aged from 61~64 during the 2004 wave. In addition to detailed demographic and socioeconomic characteristics of the respondents, the survey also obtained information regarding additional psychological characteristics and retirement planning behaviors.

The Wisconsin Longitudinal Study (WLS) provides a unique opportunity to examine factors affecting financial self-awareness over time. It provides the advantages of recently obtained financial knowledge variables, and also the ability to look back to earlier financial life. For outcome measures, a set of measures was developed to establish whether or not individuals exhibit good financial skills and knowledge of their individual finances. I defined three measures based on the 2003/5 survey data to be used in essay 2. These measures are:

- Percentage of asset categories for which respondent can provide values;
- Knowledge of amounts in checking, savings, and money market accounts;
- Knowledge of the value of retirement accounts.

The first measure is intended to capture respondent's level of awareness of his or her current financial situation. This WLS-constructed measure is a simple accounting of the

percentage of total asset categories held by the respondent (and spouse, if married) for which the respondent can provide an exact dollar amount when asked in a series of 12 questions. Asset categories include property, account balances in retirement plans, and life insurance cash values. I include in the sample only those respondents that completed the full series of asset questions. Respondents who refused to answer at least one asset question comprised about 10 percent of the full sample and were excluded from the analyses. A similar measure based on the 1992/1993 survey was adopted for essay 3 and is intended to capture the respondent's overall awareness of his or her financial situation at an earlier time, and to examine the link between this earlier financial self-awareness measure and wealth level in later life.

The second measure is intended to capture day-to-day financial awareness. I construct a binomial variable from the answer to the question, "If you added up all of your and your spouses' checking accounts, savings accounts, or money market funds, about how much would they amount to right now?" The variable is coded as 1 if respondents provided a value and 0 if they stated that they did not know the amount. Respondents also had the option to refuse to answer. Just under 10% of the sample refused to answer this question; such respondents were excluded from the analyses.

The final measure is intended to capture long-term financial planning skills. Are individuals aware of where they stand in relation to their retirement income plans? Individuals were asked whether they or their spouse "have any retirement plans that accumulate an account balance—examples include IRAs, 401(k)s, and profit-sharing plans." Approximately 75% of the sample reported having such a plan. Respondents were then asked, "If you added up all of your and your spouse's retirement plans that

accumulate an account balance, about how much would they amount to right now?”

About 20% of those who reported that they or their spouse had such accounts also reported that they didn't know the value. Another 10 percent refused to answer and were thus excluded from the analyses. The binomial variable for those with such a plan was equal to 1 if the respondent reported a value and 0 if the respondent reported not knowing the value.

Using a longitudinal data set such as the WLS has several advantages for defining measures of financial literacy. First, it allows researchers to assess both knowledge possessed in the short-run and behavioral evidence in the long-run. Second, since the population of the WLS all belonged to the same cohort and individuals are all now in their 60's, researcher can specify a particular financial behavior of interest at a certain point in people's financial lifetime, as well as over what time period the behavior is to be measured.

The Validity and Reliability of the Financial Self-Awareness Measure

The proposed financial self-awareness measures are based on several key assumptions that might raise questions as to validity. One assumption is that individuals providing a specific response do actually know the exact value of their assets. A second assumption is that those who respond “I don't know” are indicating a lack of awareness of amounts even within some reasonable margin of error, rather than simple uncertainty about the exact value of accounts at the time of interview, or just a more polite way of refusing to answer. A third assumption is that the “refusals” to necessary asset questions are randomly distributed across the sample rather than being more likely to have

characteristics correlated with the outcome variable. I propose the following several tests to be used in the empirical essays where applicable, in order to provide some assurance that these are assumptions do not lead to biased results, and that therefore the proposed measures have a reasonable degree of validity, and, in other words are an appropriate measurement instrument.

As recognized in all research methodology literature, the *validity* of a measurement instrument is the extent to which the instrument actually measures what it is intended to measure. Validity takes different forms depending on the nature of the research problem, the methodology used, and the nature of the data under study. In the social sciences, construct validity, which defines how well a test or an instrument measures up to its claims, is especially important because subjectivity plays a major part in defining and developing “constructs,” which cannot be observed directly. Construct validity includes convergent validity and discriminant validity; these occur where measures of constructs that are expected to correlate do so, and where constructs that are expected not to relate do not, respectively. Applied to the current study, since the Wisconsin Longitudinal Study (WLS) does not currently have administrative data available in order to perform a clear test of whether individuals were indeed giving accurate answers if they provided an exact value of their assets, one alternative is to test on the convergent validity of the measure. I perform a few analyses to test the potential accuracy of the responses, which are done by examining the correlations among the “know” answers. Respondents who “know” the assets in their bank accounts are expected to “know” the assets in their private pension accounts. Accordingly, the same group of people should exhibit higher percentage of knowing the amount of all assets combined.

The correlations for these are indeed high, therefore providing some assurance of the convergent validity.

The same technique is used to address the issue of whether those who responded “I don’t know” were actually indicating a lack of awareness of their asset amounts rather than simple uncertainty about the exact value at the time of interview. I found patterns of findings in this study parallel to prior studies predicting financial literacy, providing some assurance that the new measure can capture a true lack of financial awareness.

To demonstrate divergent validity, I would hope for a clear distinction between those who answered “don’t know” and those who refused to answer. In other words, I want to be certain that those who refused are actually distinct from those who say that they don’t know the value of their asset categories. It is possible, for example, that some individuals simply reported not knowing as a polite way of refusing to respond. In essay 2, I first examine the descriptive relationships between the covariates and the outcome measures. I compare those who refused to answer with those who said they didn’t know the value of their retirement plans that accumulate an account balance, including IRAs, 401(k)s, and profit-sharing plans; and those who refused to answer with those who said they didn’t know their checking account values. The descriptive analyses can indicate whether there are differences in the relationships between the main covariates (e.g. gender, cognition, and educational attainment) and those who refused to answer versus those who reported that they don’t know the value of their varying assets. There do exist differences between those who reported that they didn’t know the value of their assets and those who reported a specific value, and between refusals and those who provided an exact asset value, providing more evidence that these two groups of individuals (i.e. don’t

knows and refusals), are truly distinctive, and permitting an inference as to the validity of using “don’t know” as a measure of financial self-awareness.

Furthermore, I also conducted regression analyses to examine the relationships between the outcome measures and the predictive covariates. Two sets of regressions were conducted. The first set of analyses is for a sample that included respondents who either reported a specific value of their retirement account balance or refused to answer. The probability of refusal is estimated. An identical analysis is for a sample that included only those who either reported a value of these accounts or reported that they did not know their value. Comparing the two sets of regressions shows that the predictive variables for refusals and don’t knows are distinctly different, which implies validity for treating them as distinct.

The reliability of a measurement instrument is the extent to which it yields consistent results when the characteristic being measure has not changed. In this dissertation, the reliability of the measure is tested by reviewing financial literacy measures used in prior studies, and comparing those measures to the current proposed ones. Both existing and new measures yield similar results, in other words, classify individuals in similar ways, implying that the new measures achieve a certain level of reliability. The tests were performed by comparing the characteristics distributions (e.g. by gender, IQ, educational attainment) of those who are financially aware/literate to the characteristics distributions in other financial literacy studies. In general, the financially self-aware individuals in the current sample represent the same group of individuals as those identified by other studies, showing that similar constructs (financial self-awareness in the current study vs. financial literacy in previous studies) correlate as expected, and

indicating that the new measure offers reliability. For instance, the tests show that women are much less likely than men to exhibit financial self-awareness, i.e. to report specific assets values, which coincides with the findings of previous studies that test financial knowledge (i.e., how to calculate compound interest), thus providing some assurance regarding reliability.

Implications for Financial Education Programs

Numerous efforts by policy makers and practitioners have been made to promote financial literacy and to provide better financial education to U.S. consumers. However, research measuring the effectiveness of these efforts has not kept pace (Lyons et al., 2006). Whether these efforts are actually having an impact on consumers' financial well-being is still debatable. One main reason for this weakness of evaluation capacity is a lack of basic understanding about the program as to its expected outcomes, the core ingredients needed, and the rationale of what will work, how and why. A first step towards resolution is to identify the intended goal (knowledge and/or behavior); this can be achieved by re-defining the concept of financial literacy, as this study intends to do.

The goal of financial literacy programs is always presented as either increasing knowledge, judged according to measured gains in knowledge and attitudes, or as changing financial behaviors that must be observed to indicate the program's success. The supporters of "knowledge gains" assert that the acquisition of knowledge is itself equivalent to improving financial literacy (Coussens, 2006). In their overview of financial literacy education programs, Fox, Bartholomae, and Lee (2005) stated that "financial literacy reflects one's *understanding* of financial concepts and is important in

promoting informed financial decision making and asset management.” The consensus among program leaders supporting this point of view is providing tools for consumers, as well as increasing awareness, so that they are able to use those tools whenever relevant to make better financial decisions. On the other hand, supporters of behavioral changes posit that a person usually already possesses a basic understanding of financial concepts, and that further behavioral changes are needed to constitute evidence of success. However, several caveats of setting behavioral changes as a goal have been suggested. Lyons and Scherpf (2004) cautioned that focusing on behavior, rather than knowledge alone, might encourage program leaders to hasten financial actions for which students are not yet ready, and therefore may not necessarily reflect better management skills. One extreme example might be the recent subprime mortgage crisis, which at least partially resulted from actions by consumers who were not fit to take on the mortgage responsibilities they assumed. An awareness measure similar to the financial self-awareness measure employed in this study could have signaled the danger in this situation. The awareness measure captures consumers’ knowledge of what they have and what financial behaviors they are engaging in. Presumably persons subsequently caught up in the subprime mortgage crisis would have been caught unaware even if they have scored high on financial behaviors, i.e. holding mortgage accounts. Therefore, one ambition of the current study is the hope that both knowledge gains and behavioral changes can be accounted for in one holistic measure of financial self-awareness that does not bias toward behavior or knowledge. Knowledge gains in the basic understanding of financial concepts should be considered the short-run goal of any financial education program, constituting a first part of the concept of financial literacy, while behavioral changes over

time are the long-run goal of education, and serve as the second component of the financial literacy concept. Financial educators should set the goal of increasing consumer's financial self-awareness that presumably will lead to a better financial life.

Conclusion

Financial literacy should be treated as a composite concept that reflects both knowledge and behavior, and can increase or decrease over an individual's lifetime, as a result of demographic and family backgrounds, trigger events during the life course, time points along the life spectrum, and of course, financial education. It is not a static concept that can be easily measured by one-time test result. Financial self-awareness as constructed in the current study represents the degree to which individuals understand the financial situation that are closely related to individuals themselves and their households, which provide valuable information regarding the level of financial literacy as individuals age and how it might change when they are exposed to life changes, health problems and other events. In the two essays that follow, I expect to identify the characteristics of older consumers who better understand their pension arrangements and other aspects of their financial lives, life-time correlates associated with awareness, and the possible impact of financial self-awareness on later life financial well-being. Accordingly, the study results will provide insight on how to identify target populations that lack financial self-awareness thus might have special financial education needs, and the channels by which financial self-awareness leads to improved financial well-being. Findings are expected to be useful in developing recommendations for financial literacy education programs.

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**ESSAY TWO: THE CORRELATES OF LATER-LIFE
FINANCIAL SELF-AWARENESS – THE ROLE OF PERSONALITY AMONG
OTHER EARLY- LIFE FACTORS**

Introduction

In response to an acknowledgement that Americans are lacking the skills to effectively manage their financial lives, programs and initiatives have been developed to promote financial literacy and provide financial education to U.S. consumers. Most of the interventions provided by the federal government and financial practitioners have focused on providing specific financial skills to specific subpopulations (Collins & O'Rourke, 2010; Lyons, Palmer, Jayaratne, & Scherpf, 2006). The results of these different programs and populations have been generally positive, but small (Bernheim & Garrett, 2003; Bernheim, Garrett, & Maki, 2001; Collins & O'Rourke, 2010; Lyons et al., 2006; Way & Ang, 2010). Furthermore, these studies have focused only on short-term interventions and measure short-term outcomes (Collins & O'Rourke, 2010).

While targeted and short-term financial literacy initiatives have blossomed and been the subject of research, we know much less of the mechanisms regarding what contributes to higher financial literacy that will in turn lead to better financial well-being. In particular, little is known regarding whether and how human capital, especially non-cognitive psychological human capital, impacts financial literacy. There is a growing body of research examining the link between cognitive abilities and financial knowledge, and that between cognition and financial outcomes (Banks & Oldfield, 2007; Benjamin,

Brown, & Shapiro, 2006; Cole & Shastry, 2009; McArdle, Smith, & Willis, 2009). These studies provide evidence that cognition broadly affects financial planning, actual investment choices and wealth outcomes. Focusing specifically on early life predictors, Herd, Holden and Su examined the links between early life cognition and schooling experiences and late life financial literacy (Herd, Holden, & Su, 2012). They found that early life cognition, especially for those with very low IQ scores, and schooling both have an impact on late life financial literacy.

Thus, while there is emerging evidence demonstrating that cognition affects financial literacy, there is little research examining whether and how non-cognitive psychological human capital, such as personality traits do so. Moreover, no studies have incorporated the concept of financial self-awareness to examine the link between personality traits and financial self-awareness. What characteristics do financially self-aware individuals possess? Does personality influence one's financial self-awareness level above and beyond the effect of cognitive abilities and other early life factors? The purpose of this essay is to examine the role of personality traits in determining late life financial self-awareness. Understanding key predictors of financial self-awareness in later life will allow us to generate interventions that begin at earlier periods of individuals' life course.

In essay 1, I demonstrated the importance of financial self-awareness and provided justification as to why I employ this concept in the current study. In essay 2, I utilize this financial self-awareness variable to examine the link between non-cognitive traits, specifically personality, and late-life financial self-awareness. Motivated by modified Human Capital Theory, which incorporates psychological human capital, I

hypothesize that personality traits help to explain variations in the level of financial self-awareness seen in later life. The essay proceeds as follows. Firstly, I introduce the theoretical framework of human capital theory and its conventional usage in economic literature, followed by the development of the theory to incorporate psychological human capital. Secondly I provide existing evidence for the links between human capital and financial literacy, which are confined to cognitive human capital. Thirdly, I discuss the literature that emphasizes non-cognitive traits in studying economic behaviors, and studies that link non-cognitive traits and cognition, and how they motivate the inclusion of psychological human capital into the framework. Based on Human Capital Theory with psychological human capital incorporated, a conceptual framework is then presented to explain why personality matters to financial self-awareness. The following sections contain empirical methods and results from examining whether personality traits have an effect on financial self-awareness, and how personality traits mediate the relationship between financial self-awareness and early-life cognition, education and school experiences. The final section provides concluding comments.

Literature Review

Human Capital Theory – from Cognitive Human Capital to Non-Cognitive Human Capital

Traditional Human Capital Theory in economic literature posits that individuals invest in more years of education instead of heading into the job market in order to earn higher wages in the future, ultimately leading to the accumulation of more wealth.

Mincer (1962) and Becker (1962), probably the two most well-known authors of Human

Capital Theory, suggested that personal productivity, and hence real wages, depend critically on human capital accumulation. The theory highlights the importance of cognitive abilities that are fostered - or at least rewarded - by more years of schooling in determining a better financial outcome.

A more recent development in Human Capital Theory introduced non-cognitive human capital into the model. Heckman, Stixrud and Urzua (2006) established that a low-dimensional vector of cognitive and non-cognitive skills (e.g. personality traits) contributes to the variations in a variety of labor market and behavioral outcomes, such as wages, schooling, work experience, occupational choice, and participation in a range of risky adolescent behaviors. In particular, they found that for those varying behavioral outcomes, a significant change in the level of non-cognitive skills has an effect on behavior, which is comparable to, or even greater than a corresponding change in cognitive skills. Goldsmith and colleagues were among the few who have studied the contribution of psychological capital to wages (Goldsmith, Veum, & Darity, 1997). Using data from the National Longitudinal Survey of Youth, they found evidence that psychological capital has both a direct effect via self-esteem, and an indirect effect through locus of control, on an individual's real wage. Even more striking, the results show that an individual's real wage is more sensitive to a change in self-esteem than to comparable alterations in cognitive human capital. In other words, it suggests that psychological human capital matters more than cognitive human capital in explaining wage outcomes.

Indeed, the development of Human Capital Theory, from exclusively considering cognitive human capital to incorporating non-cognitive human capital, expands the scale

of the implications of the theory. It provides theoretical support to newer studies exploring alternative channels through which non-cognitive capital affects various financial outcomes. More importantly, it inspires this study to test the role of non-cognitive human capital in determining financial self-awareness. In the following section, I begin with a discussion of evidence from the recent financial literacy literature to illustrate that cognitive abilities might be linked to financial literacy, including behaviors.

Links between Cognitive Human Capital and Financial Literacy

Cognitive ability and financial behaviors. There is an emerging trend in the fields of economics and behavioral science of studying the relationship between cognition and economic behavior (Banks & Oldfield, 2007; Benjamin et al., 2006; Cole & Shastry, 2009; McArdle et al., 2009). Among various cognitive abilities, numeracy has been of central interest, since it is assumed that more numerate individuals may be more capable of processing information and making complex “optimal” decisions, including financial decisions such as saving and investment behavior. A study by Peters et al. (2006) provides explanations as to how numeracy affects decision-making. They found that highly numerate individuals were more likely to retrieve and use appropriate numerical principles, thus making themselves less susceptible to framing effects. Moreover, the highly numerate tended to draw stronger and more precise affective meaning from numbers and numerical comparisons after deliberation, in turn guiding them to make correct decisions. Alternatively, the less numerate were influenced more by competing, irrelevant affective considerations that hindered their capacity to make good decisions. The authors concluded that numerical ability appears to matter to judgments

and decisions in important ways, and those low in numerical ability may need different decision aids than those high in numerical ability (Peters et al., 2006). As a result, the role of numeracy has become an important aspect of studying financial literacy.

The relationship between numeracy and financial outcomes has been investigated by several other researchers as well. Recent studies confirm a link between numeracy and household wealth (Banks & Oldfield, 2007; Lusardi & Mitchell, 2005, 2007; McArdle et al., 2009). In addition to the role of numeracy, there has been growing interest in studying the relationship between other cognitive ability measures, financial decision-making and financial outcomes. For example, Cole and Shastry (Cole & Shastry, 2009) used cognitive measures obtained from the Armed Services Vocational Aptitude Battery (ASVAB) and the Armed Forces Qualifying Test (AFQT), which respectively represent “knowledge,” which may have been acquired in school, and “reasoning ability,” such as math skills, paragraph comprehension and numerical operations. They demonstrated that cognitive ability increases financial market participation, as measured by various forms of savings and investments. Also using ASVAB, Agarwal and Mazumder (Agarwal & Mazumder, 2010) found that individuals with higher ASVAB composite test scores, and specifically those with higher math scores, were substantially less likely to make financial mistakes later in life, such as using a credit card for a transaction after making a balance transfer on the account, or inaccurately estimating the value of a home on a home equity loan or line of credit. Another study on financial mistakes was undertaken by Stango and Zinman (Stango & Zinman, 2011), which showed that households presenting the cognitive bias of systematically miscalculating from information on nominal repayment levels were more likely to possess loans with higher interest rates. Elaborating

the measures of cognition, McArdle and colleagues developed a set of measures for various dimensions of cognitive ability, including measures of the stock of accumulated knowledge (crystallized intelligence) and the dimensions of cognitive ability associated with processing decisions (fluid intelligence). However, their results indicated that in explaining wealth, more elaborate measures of cognition are dominated by simple measures of numeracy (McArdle et al., 2009).

With regard to investment behaviors, cognition also plays an important role. Focusing on mutual fund managers, Chevalier and Ellison (1999) found that those who graduated from more prestigious institutions with higher average SAT scores outperform those who graduated from less selective institutions. Korniotis and Kumar (2011a) found that among individual investors, stock-selection ability in portfolio choice declines dramatically after the age of 64, which is approximately when cognitive ability declines. In a later study, Korniotis and Kumar (2011b) found that individuals with high cognitive abilities earn higher risk-adjusted returns for their stock-selection performance than those with low cognitive abilities. One existing study in Europe by Christelis, Jappelli, and Padula (2006) examined the link between directly measured household cognitive ability from math, verbal and recall tests to investment decisions. They too, found that cognitive abilities were strongly correlated with investment in the stock market.

Cognitive abilities and financial knowledge. Only more recently have some studies begun to explore the relationship between cognition and financial knowledge, which intuitively should be a mediator between cognitive abilities and financial behaviors. In part, this more recent literature has been catalyzed by findings that link cognitive ability to wealth (Lusardi and Mitchell 2005; Banks and Oldfield 2007;

McArdle et al. 2009). However, the findings from studies focused on the link between cognition and knowledge have been more mixed. In a Banks and Oldfield's study (2007), not only did the authors look at correlations between numeracy and financial asset holdings, they also discovered that numerical abilities are strongly positively correlated with knowledge of retirement information and pension arrangements. On the other hand, a study by Gustman, Stienmeier and Tabatabai (2010) using the Health and Retirement Study (HRS), explored the link between cognition (numeracy in particular) and knowledge of one's pension plan and Social Security rules. The authors presumed that one avenue through which numeracy influences wealth is through an effect on understanding of financial instruments, in their case meaning knowledge of one's pensions and Social Security. Nevertheless, they found no evidence in support of the hypothesis that knowledge of pensions and Social Security is related to cognition, and further concluded that numeracy does not influence wealth in whole or in part by affecting financial knowledge of one's pension plan.

Contrastingly, Herd, Holden and Su (2012) found that there does indeed exist a connection between cognition and financial knowledge. Their study examined whether cognition (using IQ scores from high school as a measurement) and academic performance in high school affect knowledge of one's own financial circumstances, for example, the values of one's bank accounts, value of private pensions, and percentage of asset varieties that respondents were able to give an amount to. Unlike Gustman et al., Herd and colleagues focused on early life factors, and therefore used early life cognitive ability as a predictor of financial knowledge, rather than using late life measures of cognitive ability. Moreover, while Gustman and colleagues (2010) focused on financial

literacy in late life, Herd and colleagues (2012) used a different measure of financial literacy representing awareness level of one's financial assets in late life. The results show that there is a link between early life cognition and later life knowledge of one's financial circumstances, especially for those in the lower IQ bracket and those without a college degree. The work by Herd and colleagues is a precursor of the current study, in that it focuses on early life factors, and uses "knowledge of one's own financial assets" as an indicator of financial awareness. However, their discussion of the connection between early life predictors and late life financial literacy is confined to cognitive human capital.

Thus, prior research has not fully evaluated how both aspects of human capital, including cognitive and non-cognitive abilities, may impact financial awareness. Perhaps non-cognitive abilities, for instance, personality traits, in addition to the effects of cognition, are critical to developing strong financial literacy and behaviors that are evidenced in late life. In the following section, literature on the links between personality traits and financial outcomes is reviewed.

Links between Non-Cognitive Human Capital and Financial Literacy

The role of personality in determining financial behavior. Personality is often mentioned as a potential determinant of preferences for decision making, in both financial and health care literature, however, few studies have empirically tested it (Flynn & Smith, 2007). Since personality is by nature a predisposing individual characteristic, it has been widely used as a predictor for human behavior by psychologists and other social scientists. In contrast, although economics and studies of household financial behavior have always been concerned about individual differences, and how choices - usually

rational choices - are made given individual's preferences, education, and environment, these are relatively novel areas for personality research. Personality traits were sometimes neglected in economic research in earlier times because often regarded as just another source of "unexplained" variance.

More recently, however, scholars have started to appreciate the importance of personality factors for predictions concerning economic behavior (Austin, Deary, & Willock, 2001; Perugini & De Raad, 2001). This newer literature provides insights into the factors that underlie individuals' motivation to save or engage in other forms of financial behavior. For example, a study by Hershey and Mowen investigated how two dimensions - one's personality and one's knowledge of financial planning- influence pre-retirement savings tendencies (Hershey & Mowen, 2000). They proposed a model of personality to predict individual differences in retirement preparedness and revealed that both personality constructs and financial knowledge were significant predictors of pre-retirement planning. Another study, conducted in Scotland, examined whether personality and intelligence are significant predictors of economic behaviors related to farming businesses. Using Structural Equation Modeling, they found that individuals who score high on personality traits such as Extraversion, Openness to Experience, Conscientiousness, and cognitive ability are more likely to show both production-oriented behavior and environmentally oriented behavior, however, these effects were mediated by different factors (Austin et al., 2001). Nyhus and Webley (2001) also found that personality factors such as emotional stability, autonomy, and extraversion were robust predictors of saving and borrowing behavior. Meanwhile, agreeableness,

inflexibility, and tough-mindedness could explain certain types of saving depending on the categories employed (Nyhus & Webley, 2001).

On the practical side, practitioners in the financial industry have gradually noticed the importance of taking a client's personality into account when advising them on retirement planning strategies (Adler, 2009). Some financial wealth management companies customize how their advisors communicate with their clients based on an assessment of not only the client's financial literacy and risk tolerance level, but also their personality traits. This further assessment contributes to a deeper level of communication with clients about financial issues. As an evidence of the usage of personality types, in its annual survey of retirement readiness, the Employee Benefits Research Institute (EBRI) has classified Americans into five personality types based on common beliefs or attitudes toward money and retirement planning: Planners, Savers, Strugglers, Impulsives, and Deniers (Employee Benefit Research Institute, 2002). In a related vein, a study by MacFarland, Marconi and Utkus (2004) examined how attitudes toward money and retirement planning are linked to plan participation and saving behavior. They came up with five "money attitudes" segment: Successful Planners, Up & Coming Planners, Secure Doers, Stressed Avoiders, and Live-for-Today Avoiders, with each group differing in terms of demographic and behavioral characteristics. Generally speaking, attitudinal segmentation reflects differences in personality types and suggests a correlation between personality and financial outcomes. These findings suggest directions for financial industry marketers and policymakers to better tailor their products and services to consumers based on their personality types and/or money attitudes.

Nevertheless, how personality traits relate to financial self-awareness, which is presumed to be the prerequisite of good financial behavior, still remains unknown.

In sum, research to date has been focused on the role of cognitive human capital in determining financial literacy. However, the mechanism linking non-cognitive abilities to financial literacy remains unclear. Despite increasing interest in psychological human capital within financial and economic literature, to date there have been few tests of human capital theory, especially the extent to which psychological versus cognitive human capital helps explain the variations in financial literacy. Moreover, there has been little research exploring the relationship between a comprehensive assessment of personality and financial literacy within a population of older adults, who are approaching their retirement years, with shaped and relatively stable personalities. Older adults will also have had more experiences in the financial market simply due to meeting their own needs at different life stages, as compared to younger adults. Using the modified human capital theory as a framework, I examine the role personality traits play in determining financial self-awareness, to see whether there are direct relationships, or whether personality mediates the cognitive effects. By the same token, I also examine the role of psychological orientations in determining late-life financial self-awareness. In what follows, I provide a conceptual framework explaining why personality traits and psychological orientations matter for determining financial self-awareness.

Conceptual Framework

The Role of Personality Traits in Determining Financial Self-Awareness

How do personality traits impact financial self-awareness? First, personality traits that capture a sense of control, a willingness to learn and do new things, or a tendency to plan and maintain a proactive attitude might have a direct impact on financial self-awareness. These attributes highly resemble the characteristics that a financially self-aware individual will possess. In essence, financial self-awareness represents the mindset of being willing to care for one's own financial situation, involving self-control, self-regulatory and simple planning abilities; this mindset might very well be linked to personality traits and a psychological orientation that captures characteristics formed in earlier life, but which have long-term effects into late life. Take one obvious candidate, for example, the "conscientiousness" category of the Big-Five personality traits measures self-discipline, effort, and desire to plan for the future, which, in other words, all relate to an ability to delay gratification. The trait of conscientiousness is therefore expected to affect both financial self-awareness and the following financial managing behaviors. In particular, one would expect conscientious persons to keep track of their finances, know better and have more control of their financial circumstances. Another personality trait, "neuroticism" also encompasses elements of self-control and planning, which may also impact financial self-awareness. "Emotional stability," an opposite position from neuroticism, has been found to increase discretionary saving in other studies (Brandstätter, 1996). Emotionally stable people are more likely to be able to follow their own plans and budgets than the emotionally unstable. On the other hand, neurotic people might have a tendency to give in to short-term desires, and are more likely to engage in

impulsive and excessive buying. It is likely that neurotic persons are less likely to be financially aware of their situation. In short, it is reasonable to assume that personality traits can help to explain part of the variation in financial self-awareness, which is deemed to reflect both financial knowledge and behavior, and to represent a mindset of caring one's own financial situation.

Second, personality traits might mediate the relationship between cognitive human capital and financial self-awareness. The sociological literature generally assumes that education develops psychological human capital. Indeed, there is evidence that the sense of control is a personality measure developed through schooling, and that both personality and psychological orientation measures change across the life course (Caspi, Roberts, & Shiner, 2005; Mirowsky & Ross, 2007). More years of schooling and the accumulation of greater basic skills are assumed to reduce levels of neuroticism, making individuals feel more in control, which in turn increases levels of financial self-awareness. If psychological human capital, such as one of the personality traits, helps explain the relationship between cognitive human capital and financial self-awareness, it should mediate a portion of the relationship.

Cognitive human capital such as cognition and educational attainment, and psychological human capital such as personality traits are hypothesized to correlate with the shaping of the mindset of financial self-awareness. However, one could not rule out the possibilities that other early life factors such as family values might have their influences on shaping this mindset. For instance, an individual who grew up in a family where the family value, especially the value toward financial matters, is more laid back and careless, might develop a mindset which he/her does not have to pay close attention

to his/her financial assets. Alternatively, an individual who grew up in a family where the family value is fastidious toward financial assets, requiring meticulous attention to details, might shape a distinctly different mindset which makes this individual highly aware of the situations of all the financial entities owned and take good control over these financial assets. In the current study I cannot rule out that unmeasurable factors such as family values might shape this mindset. That said, the purpose of this study is not to explore what determines this mindset, but to examine whether potential factors such as cognitive abilities and non-cognitive psychological characteristics correlate with the mindset of financial self-awareness.

In this essay, I examine the role of these personality traits and a set of psychological orientations in the relationship between cognitive human capital and financial self-awareness. Through this process I am able to demonstrate whether financial self-awareness is a separate measure by itself, or simply a proxy for personality (i.e. conscientiousness, etc.). If personality traits only are able to explain a small portion of variations in financial self-awareness, it implies that financial self-awareness is a distinctive concept, rather than a mere proxy for personality. Modified Human Capital Theory incorporates psychological human capital into the discussion of economic outcomes, which inspires my proposition that personality traits may help explain variations in levels of financial self-awareness during later life. Thus it is hypothesized that personality traits have an effect on financial self-awareness, and potentially mediate the relationship between cognitive human capital, such as early life cognition, education and school experiences, and financial self-awareness.

Specifically, it is hypothesized that some personality traits, more salient than others among the Big-Five factors, have not only direct effects on financial self-awareness (hypothesis 1a), but also indirectly mediate the effects of cognitive factors on financial self-awareness (hypothesis 2a). Selective psychological orientations are hypothesized to directly relate to financial self-awareness (hypothesis 1b), and mediate the link between cognitive factors and financial self-awareness (hypothesis 2b).

Data and Method

In this empirical study, I employ the Wisconsin Longitudinal Study (1957-2003/5) to test the relative strength of cognitive human capital (IQ scores, academic performance in high school, etc.) versus non-cognitive, psychological human capital (personality and psychological orientations) in explaining differences in late life financial self-awareness among high school graduates in their 60s. The description of the dataset and the construction of the outcome measure “financial self-awareness” are discussed in detail in essay 1. While the original WLS sample contains over 10,000 respondents, this study analyzes just over half of that original sample (6,276 cases). Cases lost to follow-up include almost 1300 respondents who had died by 2004; approximately 1400 cases that refused to answer the phone survey in 2004, in which key questions for our analysis were asked. The remaining cases were lost due to information missing on key covariates (personality variables, educational attainment and course content) or on the outcome measure.

Here I present briefly the outcome measures employed in this essay, then provide detailed descriptions of the major covariates, including personality traits variables and

psychological orientations, as well as the baseline cognitive measure. Models for empirical analyses will follow.

Outcome Measures

For outcome measures, a set of measures was developed to establish whether or not individuals exhibit good financial skills and knowledge of their individual finances. In essay 2, I defined three measures based on the 2003/5 survey data used. These measures are:

- Percentage of asset categories for which the respondent can provide values;
- Knowledge of amounts in checking, savings, and money market accounts;
- Knowledge of the value of retirement accounts.

The first measure was intended to capture the respondent's overall awareness of his or her current financial situation. This WLS-constructed measure is a simple accounting of the percent of total asset categories held by the respondent (and spouse, if married) for which the respondent can provide an exact dollar amount when asked in a series of 12 questions.¹ It is calculated by counting the number of assets that respondents provided values on, divided by the number of assets that respondents owned. Asset categories include property, account balances in retirement plans, and life insurance cash values. I included in the sample only those cases that completed the full series of asset questions. Respondents who refused to answer at least one asset question comprised about 10 percent of the full sample and were excluded from the analyses.

¹ See Appendix A for a reference of survey questions in the asset section in the WLS.

The second measure is intended to capture day-to-day financial awareness. The variable was coded as 1 if respondents provided a value and 0 if they stated that they did not know the amount. Respondents also had the option to refuse to answer. Just under 10% of the sample refused to answer this question and were excluded from the analyses.

The final measure is intended to capture long-term financial planning skills. Individuals are asked whether they or their spouse “have any retirement plans that accumulate an account balance—examples include IRAs, 401(k)s, and profit-sharing plans.” Approximately 75% of the sample reported having such a plan. About 20% of those who reported that they or their spouse had such accounts reported that they didn’t know the value. About 10 % refused to answer and were thus excluded from the analyses. A binomial variable is defined for those with such a plan that is equal to 1 if the respondent reports a value and 0 if the respondent reports that they don’t know the value.

Measurements of Psychological Human Capital

The WLS includes five personality measures (elsewhere referred to as the “Big Five Inventory” or BFI (John & Srivastava, 1999)). The measures were collected in the 1992/1993 survey and are based on self-rating according to 29 questionnaire items. Each dimension is assessed based on six items (except for neuroticism, which is based on five) that ask individuals the extent to which certain statements apply to themselves.

Responses are based on a six-point scale where the respondents either strongly agreed, moderately agreed, slightly agreed, slightly disagreed, moderately disagreed, or strongly disagreed. Thus each dimension, like conscientiousness, has a potential range in values from 1-42. The BFI has been included in other large surveys (e.g., Midlife in the United

States) and is considered a standard personality measure in psychological studies (John & Srivastava, 1999).

The “Big Five” personality measure consists of conscientiousness, extraversion, agreeableness, neuroticism, and openness. Conscientiousness measures self-discipline, effort, and the desire to plan for the future, which in other words the ability to delay gratification. The ability to delay gratification is very much related to the trait “hyperbolic discounting” studied overwhelmingly by behavioral economists. Conscientiousness and the desire to plan for the future might therefore affect both the financial awareness and the following financial managing behaviors. One would expect conscientious persons would keep track of their finances, know better and have more control of their financial circumstances. Neuroticism encompasses elements of self-control and planning, which may also impact financial awareness. “Emotional stability”, an alternative view of neuroticism, has been found to increase discretionary saving in other studies (Brandstätter, 1996). Emotionally stable people are more likely to be able to follow their own plans and budgets than the emotionally unstable. On the other hand the neurotic people might have a tendency to give in to short term desires, corresponding to the hyperbolic discounting effects in behavioral economics, and are more likely to engage in impulsive and excessive buying. It is likely that neurotic persons are less likely to be financially self-aware of one’s own situation as well. Extraversion and agreeableness both facilitate social relationships, which have a profound relationship to beneficial financial behavior (Duflo & Saez, 2003), and both are expected to have positive relationship with financial self-awareness. Openness to experience is characterized by creativity and a preference for novelty (McCrae & Costa, 2003). Individuals who are

more open are more likely to engage in financial market, however the impact on financial self-awareness is uncertain.

I also include employ the Ryff scale of psychological well-being (Ryff, 1995) as a measure for psychological human capital, which includes autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. I employ the measures collected in the 1992/1993 survey. Responses to the questions that comprised these measures were based on the same six-point scale used by respondents to answer the Big Five personality measures.

Environmental mastery and autonomy are closely aligned with one's sense of control, and self-acceptance is an alternative to self-esteem (House et al., 1994; Ross & Wu, 1995). These are potential predictors of higher financial self-awareness. Personal growth is similar to openness in that they both emphasize intellectual curiosity and adaptability that may lead individuals to both seek out and adapt their lives to the latest research on ways to improve financial well-being. Positive relations with others are closely related to extraversion and agreeableness in the Big-Five, and therefore are expected to have a positive effect on financial self-awareness. Purpose in life is expected to have results similar to conscientiousness.

Measurements of Cognitive Ability

There are various ways to measure cognitive ability. The most straight-forward method is to use standard intelligence tests results (i.e. IQ tests) to produce an indicator of "general cognitive ability." General cognitive ability refers to the most important

common factor underlying individuals' performance on a range of cognitive tests (Jensen, 1998). A variety of studies have devised general cognitive ability to assess its correlation with behaviors and outcomes (see Jensen, 1998, for a review). An alternative is to use academic achievement test results as a proxy for general cognitive ability, these include grades in elementary school and Scholastic Assessment Test (SAT I) scores. Studies have found that grades in elementary school have a correlation coefficient of around 0.70 with general cognitive ability (Jensen, 1998), while SAT I scores correlate greater than 0.80 with measures of general cognitive ability (Frey & Detterman, 2004). A study by Benjamin et al. (2006) measured cognitive ability using both standardized test scores and school grades in high school. Other studies have created their own measures for general cognitive ability. For example, Frederick, in his 2005 study, used a Cognitive Reflection Test (CRT) to measure one type of cognitive ability (Frederick, 2005). CRT is a 3-item short questionnaire that is "easy" in the sense that questions solutions are easily understood when explained, yet reaching the correct answer often requires suppression of the "impulsive" erroneous answer that comes to mind first. After introducing the CRT measure, Frederick showed that CRT scores are predictive of decision-making characteristics such as time preferences and risk preferences. He also compared CRT with other cognitive ability measures including SAT and ACT (American College Test) and showed that CRT is as good a measure and sometimes better than others.

In the current study, I use a set of independent variables intended to capture basic cognitive ability and the early acquisition of skills that are likely to enhance the lifetime capacity of individuals to read about, understand, rigorously critique, and act on complex information. First and foremost is the summary baseline measure of IQ from the WLS,

measured in 1957, i.e. when the respondents had just graduated from high school. The reason for using baseline IQ measures is that I want to examine whether cognition, as one of the early life factors, is critical to developing strong financial self-awareness evidenced in late life.

Childhood cognitive ability/IQ. These scores, measured in 1955–57, available through school district administrative records, are derived from the Henmon-Nelson Test of Mental Ability, which was administered to high school students in Wisconsin. The Henmon-Nelson test is considered a general measure of intelligence, but a recent analysis has indicated that, although it captures both fluid and crystallized intelligence, it is more strongly correlated with crystallized intelligence (Pallier, Roberts, & Stankov, 2000). Fluid intelligence is the general capacity to think logically and solve problems in novel situations, while crystallized intelligence is the depth and breadth of an individual's knowledge and his or her ability to actually use that knowledge. It is important to note that although high school rank and IQ are correlated ($r=0.58$), there is still meaningful variation that makes it worthwhile to examine the two variables separately. I ran this variable as a series of three splines. The first was for IQ scores below 90; the second spline was for IQ scores from 90 to 120; and the third spline was for IQ scores above 120.

Educational attainment. This measure calculates years of schooling, derived from the highest degree attained and number of years of higher educational attainment. It is a measure based on reports from 1992/3. The measure ranges from 12 to 20 years, with 12 being a high school diploma and 20 indicating the attainment of a PhD.

High school rank. This measure is a percentile rank based on high school grades $[100 - (\text{rank in class} / (\# \text{ of students in class})) * 100]$ measured in 1957. Rank was then divided into quartiles. The general correlation between grades and standardized test scores is high at 0.9, reducing concerns that grades or rank may reflect teacher bias (Willingham, Pollack, & Lewis, 2002). This measure reflects high school grades and can act as a complementary measure to IQ.

Course content. Three measures are derived from 1957 data, and are used to capture the kinds of courses students took in high school. Two math-related measures capture the presumed acquisition of advanced math skills, the general computational skills required for financial literacy. One of the measures indicates whether the student took physics or trigonometry. The second measure indicates whether the student took the average number of semesters of algebra, fewer than the average, or more than the average among the WLS cohort.² A student could report up to four semesters of algebra. Over half of the sample reported they had taken two semesters of algebra. The third measure captures the acquisition of what could be labeled general literacy skills not specific to financial literacy, but necessary for reading and understanding complex writing. It indicates whether the student took the average number of semesters of English, fewer than the average, or more than the average. Students could report whether they took 0, 2, 4, 6, or 8 semesters of English.

² Minimum math requirements for high school graduation in Wisconsin were not yet established until the 1980's, long after the high school careers of the WLS sample. Therefore, I used "2 semesters of algebra" as a dividing point because most respondents took 2 semesters when they were in high school. More than 2 should thus represent that the respondents have better numeric skills or interest in numeric matters, or they planned to continue to some advanced degree; while fewer than 2 might mean a lower level of numeracy.

Confounding Covariates

This set of variables includes those that, if excluded, might lead to biased estimates of the influence of the previous set of major covariates. This could be either because they are themselves causal of those major covariates, or because they enhance the contributions of those characteristics. Thus, the sets of confounding variables will be different when discussing relationship between non-cognitive human capital to financial self-awareness, and relationships involving cognitive human capital. The most straightforward example would be parents of high socioeconomic status with financial skills of their own who pass these on to their children; as adults, those children should be more financially literate regardless of their high school course selections, although these should also be influenced by their parents' expectations.

Parental socioeconomic status. It is critical to control for parental socioeconomic status in models that include both cognitive ability and non-cognitive ability measures, because it may predict schooling measures (attainment, rank, coursework), cognition, and outcome measures. The parental socioeconomic status measure is a WLS-created factor-weighted score ranging from 1 to 97. The score is based on: 1) highest number of years of schooling for respondent's mother and father, 2) Duncan SEI occupational score for respondent's father's occupation, and 3) four-year average of parental income between 1957 and 1960, based on Wisconsin tax records.

College graduates vs. Non-college graduates. There are distinctive differences between individuals with and without college degrees in the descriptive relationships between the outcome variables and the covariates. More importantly, previous research on the link between cognitive abilities and financial literacy shows distinct results for

college graduates and non-college graduates (Herd et al., 2012). Moreover, it is suspected that personality and psychological characteristics will have different effects on financial self-awareness for individuals with college degrees and those without. College education may enhance or cultivate certain types of personalities such as decreasing agreeableness, and increasing conscientiousness, openness, autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. I expect to see stronger relationships among these personality traits and financial self-awareness among college graduates, since these personality traits are suspected to have positive relationships with financial self-awareness level. One way to control for the confounding effect of college degree status is to run separate models for those with at least a college degree and those without a college degree.

It should be noted that childhood IQ is treated as a confounding variable when the main focus is on the link between psychological factors and financial self-awareness. It is critical to control for cognitive ability measured by childhood IQ when examining the relationship between personality traits and financial self-awareness, since previous research has demonstrated that childhood IQ predicts awareness levels, and may increase or decrease the contributions of personality traits. Moreover, gender is also included in all models as a control variable for all relationships.

Models

In an earlier attempt, there has been evidence that cognition and academic performance in high school have impacts on awareness/knowledge of one's financial resources/situation in late life, especially for those with lower IQ and without a college

degree. It is also known that early life schooling experience, especially whether respondents took specific subjects in high school, has an impact on awareness/knowledge of financial resources (Herd et al., 2012). As a step forward, I test my hypotheses by examining the extent to which personality and psychological characteristics mediate the relationship between cognition and late life financial awareness. In other words, the objective is to answer the research question: *What roles do personality traits and psychological characteristics play in determining financial self-awareness in late life?*

The analyses include logit and ordinary least square (OLS) regressions, depending on whether the outcome variable in question is a binary know/don't know response, or the percentage of asset categories for which respondents could give values. An OLS model of the predictors of the percentage of asset categories was estimated. A logit model was employed for the binary outcome measures regarding whether individuals know the value of their pension accounts and whether they know the value of their bank accounts. I employ three models for each outcome variable. Moreover, since there are distinctive differences between individuals with and without college degrees in the descriptive relationships between the outcome variables and the covariates, I run separate models for those with at least a college degree and those without a college degree.³ Model 1 includes only cognitive human capital (childhood IQ, high school ranking, educational attainment and course content) and control variables (parental SES and demographics), in order to establish the basic relationship between cognitive human capital and the financial self-

³ Post estimation Chow tests were conducted for test of overall homogeneity of regressions. Results indicated that relationships between IQ, psychological and other early life factors and the outcome variable vary significantly for individuals with 4-year college degrees versus those without, thus the need of having separate models.

awareness measures. Models 2 and 3 add 1992 measures of psychological human capital—the Big-five personality and Ryff scale psychological well-being variables, respectively—to the measures included in model 1 in order to test whether they have independent effects on the outcome variables (hypothesis 1), and the extent to which they mediate the relationship between cognitive human capital and the outcome variables (hypothesis 2).

Results

I found that psychological human capital, such as personality traits and psychological orientations, do have independent effects on late life financial self-awareness, with neuroticism, openness, personal growth and positive relations with others having more salient effects. Furthermore, inclusion of psychological human capital in the models slightly reduces the impact of cognitive measures on late-life financial self-awareness under certain circumstances, especially for individuals with college degrees. In short, it is not simply cognitive human capital from early-life that relates to late-life knowledge of one's own financial assets; select psychological human capital plays a critical role, for individuals with and without college degrees. Personality and psychological orientations mediate the relationship between cognitive human capital and financial self-awareness for some subpopulations. The mediating effects only occur among individuals with college degrees, and are limited to more specific knowledge, such as knowing the balance of one's private pension accounts.

Table 2-1 shows simple bivariate correlations between individual characteristics, including demographic and cognitive human capital, and the three outcome variables.

Around 72% of respondents who had retirement savings accounts reported that they knew the value of their balance-accruing retirement savings plans. A slightly higher percentage of individuals who had such accounts knew the value of their checking, savings, and mutual fund accounts (81%). For the sample, on average of 89% of total assets were reported. Put another way, individuals were able to provide values for 89% of the questions focused on asset amounts. For most of the outcome measures, there are significant differences according to gender, educational attainment, and IQ, between those with fewer than 6 semesters of English in high school and those with up to 8 semesters of English, more versus fewer semesters of algebra in high school, and between those who took physics or trigonometry in high school and those who did not. These basic patterns held across the outcomes. The main variation from these themes was that the number of semesters of English in high school was not correlated with the bank account knowledge variable.

Tables 2-2 and 2-3 show simple bivariate correlations between psychological human capital, including Big-Five personality measures and Ryff scale psychological characteristics measures, and the three outcome variables. For demonstration purposes, I broke down each personality factor and each psychological characteristic into quartiles, in order to see the distributions across categories. For most of the outcome measures, there are significant differences across categories, and within measures of neuroticism, openness, positive relations with others, and purpose in life. The main variations observed come from neuroticism and positive relations with others, with patterns held across the different outcomes. More neurotic individuals seem to have lower financial self-awareness as to pension accounts, bank accounts and assets levels, implying that

neurotic individuals lack abilities in self-control and planning, which contributes to low financial self-awareness. The finding that individuals with more positive relations with others also have lower financial self-awareness might be more puzzling. It is also interesting to note that the results for conscientiousness and autonomy do not exhibit the expected positive effects on financial self-awareness.

Table 2-4 presents the findings from OLS regressions, where coefficients indicate the effects of the covariate on the outcome measure: percentage of assets categories for which respondents provided dollar values. Model 1, demonstrates, among those both with and without college degrees, that early-life experiences related to both schooling and cognition are linked to late-life financial self-awareness. But these effects vary in important ways across the sample. In particular, the effects of early academic measures (including academic performance and course content) are somewhat weaker correlates, but present for those with college degrees. Having more semesters of algebra and having taken trigonometry and/or physics (both with borderline statistical significance) were both positively correlated with the outcome. Both indicated that individuals provided exact dollar values for 1.6% more of their total assets. Being male had especially large effects, on the order of an 8.6% difference compared to women. While parental socioeconomic status was negatively correlated with the outcome, its effect was small. Nevertheless, it is interesting to note that respondents who had come from higher socioeconomic backgrounds actually had less knowledge of their asset levels.

In contrast, the effects of early-life cognition appear largely confined to those with IQ scores toward the bottom distribution of IQ scores and among those without college degrees. Unlike with college graduates, increases in IQ within the two bottom IQ

categories were positively correlated with respondents' knowledge of their asset levels. A gain of approximately 10 points in IQ in the less than 90 IQ range increased the percentage of assets reported with precision by about 3%. The effect of a 10-point gain for those in the 90–120 IQ range was 2%. There were no significant associations for those with IQ scores over 120. So the difference for an individual with an IQ score of 120 compared to an IQ score of 70 was 13 percentage points. High school rank, or academic performance, was a correlate for those without a college degree. Among those who did not go to or complete college, there was a 2.6% difference for those at the top compared to the bottom quartile of their high school class. Though cognition and academic performance were correlated with asset knowledge for this sample, coursework in high school was not. But as among those with college degrees, being male was strongly correlated with having more knowledge of one's asset levels (a 9% difference between men and women).

Models 2 and 3 of Table 2-4 present findings that provide little support for the hypotheses that psychological human capital, as measured by personality and psychological well-being, mediates a large portion of the relationship between cognitive human capital and financial self-awareness measured by percentage of total assets that respondents could give exact values for. However, findings provide some evidence for the hypotheses that at least some of the psychological human capital measures have independent effects on asset value awareness.

Model 2 includes the standard Big Five personality measures. For individuals with college degrees, neuroticism has a significant, negative relationship with asset level awareness, and openness has a positive relationship with asset levels awareness. An

increase of approximately 10 points in neuroticism decreased the percentage of assets reported with precision by about 2%, while an increase of 10 points in openness increased the reported percentage by 2%. The inclusion of personality measures had almost no influence on the relationship between cognitive human capital and asset levels awareness (as indicated by the cognitive human capital coefficients). The inclusion of psychological characteristics measures (in model 3) had a limited impact on the cognitive human capital coefficients, although some of them do have independent effects on asset level awareness. Having a sense of personal growth, for example, does exert a positive and significant impact on awareness, by 3% for each 10-point increase. However, a higher measure of positive relations with others, on the contrary, has a significant, negative relationship to awareness. For individuals without college degrees, neither personality measures nor psychological characteristics have mediating effects observed for the relationship between cognitive human capital and asset levels awareness. However, it is interesting to note that having a sense of purpose in life does exert a positive impact on asset levels awareness, increasing this measure by 3% for every 10-point increase in sense of purpose.

The results given in Table 2-5, which represent the outcome of respondents' knowing the value of retirement plans that accumulate a balance (such as a 401(k)), present a slightly different story from the results in Table 2-4. Table 2-5 presents findings from logit regressions, where coefficients indicate the average marginal effects of the covariate on the outcome measure, awareness of pension account balances. In the baseline model 1, where the focus is on cognitive human capital, for college graduates, both additional levels of schooling and being male were correlated with knowing the

value of one's retirement account accumulations. Each additional year of schooling increased the probability of knowing the value by 2.3%. The probability of a man knowing the value of his retirement savings account was 18% higher than for a comparable woman. In contrast, for those without a college degree, being male had a smaller but still significant influence and cognition had significant effects. Each 10-point increase in IQ in the less than 120 range led to a 3–4% increase in the probability of knowing one's private pension account value. Accordingly, the difference for an individual with an IQ score of 70 compared to an IQ score of 120 was 18 percentage points.

Results presented in models 2 and 3 of Table 2-5, however, do provide support for the hypothesis that psychological human capital helps explain the link between cognitive human capital and pension account awareness, especially for those with college degrees. Cognitive human capital coefficients, in particular years of schooling coefficients are substantially, but not totally, mediated by measures of personality and psychological characteristics. The Big-Five personality measures reduce the years of schooling coefficient by 25% from the level in model 1 (as shown in model 2.) Ryff scale psychological characteristics reduce the years of schooling coefficient even more, by 27.5% from the level in model 1 (as shown in model 3).⁴ Moreover, neuroticism, openness, and personal growth also have independent effects on pension account

⁴ Sobel tests were conducted to test the significance of the mediating effects from the Big-Five personality traits and Ryff scale psychological characteristics in the relationship between cognitive abilities and the level of awareness of private pension accounts. Results show that for individuals with a 4-year college degree, Big-Five personality traits mediated about 7% of the total effect from schooling, and the mediating effect is significant at $p < 0.001$ level. Ryff scale psychological characteristics are also significant mediators, mediating about 8% of the total effect for college graduates.

awareness, similar to the situation seen for asset levels awareness but with greater magnitude. For example, a 10-point increase in the measure of neuroticism decreased the probability of knowing pension account values by 6%, while a 10-point increase in the sense of personal growth increased the probability of knowing pension account values by 6%. The financial self-awareness measure of knowing one's pension account value seems better able to reveal variations due to individual differences in personality/psychological characteristics, and to reveal their mediating roles. However the mediating effects appear confined to college graduates. For individuals without college degrees, no significant mediation effects were observed. One possible explanation is that, psychological human capital mediates the relationship between cognitive human capital and financial self-awareness more through factors such as years of schooling, these being a more significant factor for college graduates, rather than through childhood IQ, to whose effects are confined those without college degrees.

The results in Table 2-6 represent the outcome of whether the respondent knows the value of his or her bank accounts, including checking accounts, saving accounts, and money market accounts. Marginal effects of the covariates are presented here. For college graduates, the only even marginally significant covariate, besides being male, was the number of algebra courses taken in high school. The odds (calculated but not reported in the table) of knowing one's checking account balances were 34% higher (or a 2.5 percentage point difference) for those who took the highest number of algebra courses compared to those who took the average number. But for those without college degrees, the results roughly paralleled the prior outcome variables (asset knowledge and retirement savings account knowledge). In short, for those with IQs between 90 and 120,

the probability of knowing one's bank account values were about 3 percentage points higher for each additional 10 points of IQ. Accordingly, the difference between an individual with an IQ score of 90 and one with an IQ score of 120 was 9 percentage points.

Findings in models 2 and 3 (which add personality and psychological well-being measures, respectively, to the variables in model 1) suggest that psychological measures do affect the relationship between cognitive human capital and financial self-awareness, at least for college graduates. Cognitive human capital coefficients, in particular the number of algebra courses taken in high school, are substantially, but not totally, mediated by measures of personality and psychological characteristics. The Big-Five personality measures increase the took more than average algebra courses coefficient by 25% from the level in model 1 (as shown in model 2.) Ryff scale psychological characteristics increase the took more than average algebra courses coefficient even more, by 30%, from the level in model 1 (as shown in model 3). It could be that by including psychological human capital measures, the suppressed effects from academic choices are revealed. Here, psychological human capital measures act as suppressors rather than mediators in the relationship between cognitive human capital and the awareness measure. As for the independent effects, having a sense of personal growth has significant positive effects on awareness of bank accounts values for college graduates. For individuals without college degrees, the relationship between IQ and awareness of bank accounts values is not affected by the inclusion of personality and psychological measures. Neither personality measures nor psychological measures alter the relationship between IQ and awareness of bank accounts values (either the coefficients or their level

of significance). However, extraversion, agreeableness, neuroticism and positive relations with others have negative independent effects on awareness of bank accounts' values. While most of these relationships are only marginally significant ($p < .05$), neuroticism was more than marginally significant ($p < .001$).⁵

There are some caveats to this study that should be addressed. One weakness of the WLS data is that it is a homogenous sample of white Wisconsin high school graduates from 1957. Overall, this is a relatively well-educated sample and thus has relatively high levels of financial self-awareness level as measured in this study. Thus, these analyses cannot tell us how those without high school degrees fare, although the link between lower cognitive scores and financial self-awareness gives some indication of what that relationship may look like.

While this has obvious disadvantages, a relatively homogenous sample can help rule out unobserved variable effects that would arise from birth cohort, education level, and geographic area correlates. Though many observed variables can be accounted for, such as sex, there are numerous correlates, such as cultural differences, which are harder to account for but which are still potential confounders.

It's also important to keep in mind that this is a single cohort. Analysis of this cohort is valuable for understanding influences on the financial self-awareness of

⁵ Sensitivity analyses were conducted to include respondents' marital status in the models as a potential mediator in the relationship between cognitive and psychological factors and financial self-awareness outcome variables. For college graduates, comparing to married individuals, widowed and divorced/separate individuals are more likely to be aware of their private pension accounts, their bank accounts and to have higher percentage of asset categories for which they know values. Never married respondents are also more likely to be aware of their private pension and bank accounts, comparing to married ones. Similar patterns were found for non-college graduates. However, marital status only has independent effects on awareness measures. No mediating effects were found with marital status added to the original models.

younger individuals. In short, members of the WLS cohort, like younger cohorts, face a complicated array of choices surrounding retirement savings. As is the case with younger cohorts, retirement income is dependent on how careful and knowledgeable individuals are as they face a financial landscape that has changed significantly over the last 20 years with the shift towards defined contribution pension plans and individual retirement accounts and away from defined benefit plans. The responsibility for saving and investing wisely for retirement falls largely on individuals.

Another caveat regards the sample selection. All of the analyses excluded those who refused to answer the asset value questions. Sensitivity analyses were employed to test the consequence of excluding those who refused to answer. Firstly, I want to be certain that those who refused are actually a distinct group from those who said that they don't know the value of their asset categories. It is possible, for example, that some individuals simply reported not knowing as a polite way of refusing to respond. I first examined the descriptive relationships between the covariates and the outcome measures. I compared those who refused to answer with those who said they didn't know the value of their retirement plans that accumulate an account balance, those accounts including IRAs, 401(k)s, and profit-sharing plans, and their checking account values. The descriptive analyses show that there are differences in the relationships between the main covariates (e.g. gender, cognition, and educational attainment) and those who refused to answer versus those who reported that they don't know the value of their varying assets. There exist differences between those who reported that they didn't know the value of their assets and those who reported a specific value, and between refusals and those who provided an exact asset value, providing some evidence that these two groups of

individuals (i.e. don't knows and refusals), are truly distinctive. Furthermore, I conducted two sets of regression analyses. The first set is for a sample that included respondents who either reported a specific value of their retirement account balance or refused to answer. The probability of refusal is estimated. An identical analysis is for a sample that included only those who either reported a value of these accounts or reported they did not know that value. Comparing the two sets of regressions, gender played an important role in distinguishing between the "don't knows" and refusals. The predictive value of gender was much smaller for a refusal than a "don't know" response. This is consistent with the literature that finds women possess lower financial literacy than do men, which implies that the "don't know" predictors do predict difference in financial awareness, while refusals are possibly caused by wealth-related factors. When running sensitivity models separately for men and women, for men, education and IQ were predictive of "don't know" but not refusals; women who refused to answer had lower IQ scores and were less likely to have taken advanced math courses in high school. It appears that women may have been more likely to refuse when they did not know asset amounts. In short, evidence shows that excluding refusals, especially among women, may mean that the estimates are conservative. Among women, it appears that refusing to state the value of things like assets may actually have been indicative of a lack of awareness. Thus, the basic pattern of findings appears to remain the same regardless of excluding refusals.

The second issue with sample selection regards the fact that in the case of the pension variable, about 20% of the overall sample did not have such an account. Clearly, these individuals are a select group, with those having accounts also more likely to have characteristics that affect the probability of their knowing account values. Those who did

not contribute to defined contribution accounts were more likely to be women, to have low incomes, and to have low educational attainment. These findings about financial self-awareness predictors must be understood as reflecting relationships only for individuals who are likely to have these kinds of market-based, individualized (defined contribution) retirement savings accounts. However, it is important to understand how those with the most complicated financial lives are coping, and the sources of variation in terms of their skills. So the findings are important, but must be understood in the context of the specific population.

Conclusion

The main findings from this paper are that non-cognitive human capital, such as personality traits and psychological orientations, not only independently relate to late-life financial self-awareness above and beyond the effect of cognitive abilities and other early life factors, but also indirectly mediate the relationship between early-life cognitive human capital and late-life financial self-awareness, especially for those with college degrees. In other words, personality traits and psychological orientations do help explain partial, but not all variations in levels of financial awareness in late life. Cognitive human capital coefficients, especially the effects of years of schooling and courses taken in high school, are substantially, but not totally, mediated by measures of personality traits and psychological orientations. The independent, separate effects of personality traits and psychological orientations, conditioning on other factors including cognitive abilities, indicate that personality traits and psychological orientations help explain some variation

in financial self-awareness that cannot be explained by cognitive abilities, however, they cannot explain a large amount of variations, as would be the case if financial self-awareness were merely a proxy for them. Meanwhile, the inclusion of personality measures or psychological characteristics measures has almost no influence, or at best a limited impact, on the relationship between cognitive human capital and asset levels awareness. Where there is a limited impact (e.g. when outcome measure is awareness of private pension account balances for college graduates) the marginal effects of cognitive abilities on financial self-awareness decline although they are still sustained and remain significant. These findings help validate financial self-awareness as a distinct measure of financial literacy, rather than just a proxy for personality traits or psychological orientations. In essay 1, I defined financial self-awareness as the level of knowledge one has regarding one's own personal finances. I use data that are often collected in surveys and thus can provide insight into financial knowledge across populations, even when financial literacy is not targeted by a survey. It seems reasonable to argue that these questions reflect levels of financial literacy required by an individual's circumstances: (1) Can you precisely identify all of your assets and their value? (2) Can you identify the value of assets most immediate to day-to-day financial transactions, such as your checking accounts? and (3) Can you identify the value of assets important to life-course planning, such as your retirement savings accounts? The findings provide evidence that the financial literacy measures captured by financial self-awareness do relate to both cognitive human capital and non-cognitive human capital, but cannot be replaced by either cognition or psychological human capital.

The findings concerning the relationship between personality traits and financial self-awareness correspond to what was originally suspected. Neuroticism and openness to experiences are found to relate to financial self-awareness as expected as well as suggested by previous literature (Austin et al., 2001; Nyhus & Webley, 2001). Individuals who are less neurotic have a better sense of control and are better at planning, which might contribute to the correlation with financial self-awareness. Individuals who are more open to experience are more likely to engage in financial markets, which probably has a positive influence on financial self-awareness as well. However, surprisingly, personality traits such as conscientiousness and autonomy are not significantly related to the outcome variables. This lack of evidence helps to confirm the assertion that financial self-awareness is a more complex concept than just a specific type of personality trait, as most people might originally expect.

This study contributes to the literature by validating financial self-awareness as an important and separate measure from existing financial literacy measures. The findings support the hypothesis that non-cognitive human capital—which includes personality traits and psychological orientations —helps explain 1) variations in late-life financial self-awareness among a sample of Wisconsin high school graduates from the class of 1957, and 2) the link between cognitive human capital and financial self-awareness in late-life, especially for those with college degrees. Results demonstrate that financial self-awareness is a separate measure by itself, not simply a proxy for personality or psychological orientations, since it is capturing something more than what personality and psychological orientations can capture. In practical terms, it speaks to the importance to later-life financial literacy of general skills and the role of personality traits. Thus,

while targeted interventions later in life are likely effective, these results emphasize the importance of more general skills, which are achieved through schooling and cognitive investment in early life and perhaps in mid life as well, and the need to tailor the interventions according to psychological characteristics. Also, the specific skills needed to manage finances effectively have changed dramatically over time. It is critical to provide intervention opportunities promoting financial self-awareness and enhancing general skills that are adaptable to changing financial circumstances, with approaches that can accommodate variations in psychological human capital across the life course to improve financial well-being in later life.

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	Know Retirement Plans Amounts		Know Bank Account Amounts		Percent of Asset Type for Which Value Given	
	%	freq.	%	freq.	mean	freq.
Proportions of the whole sample	71.79	3827	80.66	5555	0.89	6276
Demographic variable						
Gender						
Male	81.38	2067	85.51	2755	0.93	2958
Female	63.06	1760	76.4	2800	0.84	3318
College degree						
College degree	76.9	1215	82.9	1600	0.91	1760
Non-college degree	69.63	2612	79.79	3955	0.87	4516
Race						
White	71.78	3820	80.64	5540	0.89	6261
Non-white	77.78	7	88.24	15	0.89	15
Parental SES						
1st quartile	69.89	931	79.45	1450	0.87	1658
2nd quartile	71.5	898	82.37	1364	0.89	1512
3rd quartile	73.92	992	81.21	1383	0.90	1571
4th quartile	71.81	1006	79.74	1358	0.89	1535
Cognitive Human Capital						
Childhood IQ <90	63.25	635	75.74	1071	0.85	1254
IQ 90~110	71.86	1938	81.12	2858	0.89	3241
IQ 110~120	75.15	641	83.48	859	0.92	942
IQ >120	78.89	613	83.28	767	0.92	839
Algebra Taken in HS						
2 Semesters of Algebra	70.18	2020	80.01	3026	0.88	3449
<2 Semesters of Algebra	65.31	740	77.79	1219	0.86	1412
>2 Semesters of Algebra	81.1	1047	85.18	1310	0.93	1415
English Taken in HS						
8 Semesters of English	72.35	2726	81.3	3874	0.89	4351
6~7 Semesters of English	71.63	904	79.2	1367	0.88	1569
<6 Semesters of English	65.45	197	79.29	314	0.88	356
Trigonometry or Physics Ever	80.21	1548	84.47	2023	0.92	2198
Trigonometry or Physics Never	67.01	2279	78.63	3532	0.87	4078
High School Rank						
Lower than 25th Percentile	71.65	786	80.28	1221	0.87	1396
25~50 Percentile	68.93	823	79.3	1295	0.88	1478
50~75 Percentile	71.09	1040	80.86	1479	0.89	1668
>75 Percentile	74.7	1178	81.93	1560	0.90	1734
N=		5331		6887		6276

Note. Data from the Wisconsin Longitudinal Study, 1957–2003/2005. Chi-squared tests were used to test the bivariate relationships between characteristic variables and the knowledge variables. Percentages and means are shown in bold when there exist significant differences among groups at $p < .05$. High school rank is imputed for missing values.

	Know Retirement Plans Amounts		Know Bank Account Amounts		Percent of Asset Type for Which Value Given	
	%	freq.	%	freq.	mean	freq.
Proportions of the whole sample	71.79	3827	80.66	5555	0.89	6276
Psychological Human Capital						
Big-Five Personality Measures						
Extraversion						
1st quartile	74.67	914	81.9	1267	0.89	1428
2nd quartile	72.2	966	82.59	1414	0.89	1558
3rd quartile	71.2	571	78.19	810	0.89	939
4th quartile	73.76	818	81.31	1118	0.89	1261
Agreeableness						
1st quartile	73.87	885	82.75	1238	0.90**	1369
2nd quartile	74.9	767	81.41	1064	0.90**	1199
3rd quartile	72.72	997	81.86	1412	0.89**	1583
4th quartile	70.45	620	78.37	895	0.88**	1036
Conscientiousness						
1st quartile	72.91	907	81.45	1322	0.89	1493
2nd quartile	73.59	755	82.34	1068	0.89	1194
3rd quartile	73.19	868	81.37	1192	0.90	1330
4th quartile	72.72	741	80	1032	0.89	1176
Neuroticism						
1st quartile	77.47***	942	84.07***	1277	0.91***	1407
2nd quartile	75.08***	967	82.83***	1331	0.90***	1481
3rd quartile	71.67***	716	79.7***	1001	0.88***	1137
4th quartile	66.63***	643	77.81***	996	0.87***	1156
Openness						
1st quartile	68.59**	738	79.53	1154	0.87***	1320
2nd quartile	72.94**	795	80.34	1095	0.89***	1245
3rd quartile	74.45**	973	83.34	1341	0.90***	1479
4th quartile	76.31**	760	81.76	1013	0.90***	1135
N=		4501		5710		5220

Note. Data from the Wisconsin Longitudinal Study, 1992-1993 and 2003-2005. Chi-squared tests were used to test the bivariate relationships between characteristic variables and the knowledge variables. * $p < .05$; ** $p < .01$; *** $p < .001$.

	Know Retirement Plans Amounts		Know Bank Account Amounts		Percent of Asset Type for Which Value Given	
	%	freq.	%	freq.	mean	freq.
Proportions of the whole sample	71.79	3827	80.66	5555	0.89	6276
Psychological Human Capital						
Ryff Scale Psychological Characteristics						
Autonomy						
1st quartile	70.07	948	79.57	1375	0.87***	1568
2nd quartile	74.15	898	83.36	1237	0.90***	1379
3rd quartile	75.25	687	82.02	935	0.90***	1037
4th quartile	73.41	751	80.18	1088	0.90***	1235
Environmental Mastery						
1st quartile	72.54	943	81.67	1399	0.88*	1583
2nd quartile	75.07	753	83.41	1041	0.91*	1136
3rd quartile	73.18	745	80.62	1044	0.89*	1189
4th quartile	71.44	843	79.23	1152	0.89*	1312
Personal Growth						
1st quartile	73.04	818	81.87	1174	0.88	1325
2nd quartile	72.71	986	80.56	1372	0.90	1561
3rd quartile	73.42	649	80.95	918	0.90	1029
4th quartile	72.83	831	81.43	1171	0.89	1304
Positive Relations with Others						
1st quartile	76.22***	872	83.16***	1215	0.90***	1349
2nd quartile	74.67***	1020	82.83***	1414	0.90***	1556
3rd quartile	73.21***	653	81.49***	929	0.89***	1037
4th quartile	67.24***	739	76.96***	1079	0.87***	1277
Purpose in Life						
1st quartile	72.16	793	80.71*	1180	0.88***	1350
2nd quartile	74.62	1026	83.53*	1425	0.91***	1555
3rd quartile	72.4	674	80.26*	923	0.90***	1040
4th quartile	72.24	791	79.57*	1106	0.89***	1273
Self-Acceptance						
1st quartile	72.91	810	81.99	1197	0.89	1343
2nd quartile	72.11	923	82.08	1310	0.90	1460
3rd quartile	74.41	878	81.32	1206	0.89	1350
4th quartile	72.44	673	78.87	922	0.89	1065
N=		4501		5710		5220

Note. Data from the Wisconsin Longitudinal Study, 1992-1993 and 2003-2005. Chi-squared tests were used to test the bivariate relationships between characteristic variables and the knowledge variables. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2-4
OLS Regression: Awareness of Asset Levels Regressed on Cognition, Educational Attainment, Academic Performance, Personality, and Psychological Orientation; Wisconsin Longitudinal Study, 1957-2003/2005

	College Degree			No College Degree		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Cognition						
IQ Spline (70-90)	0.001 (0.002)	0.001 (0.003)	0.001 (0.003)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
IQ Spline (90-120)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
IQ Spline (120+)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.002)	0.000 (0.002)	0.000 (0.002)
High School Academic Performance Algebra (reference = 2 Semesters)						
<2 Semesters of Algebra	0.022 (0.022)	0.015 (0.023)	0.016 (0.023)	-0.004 (0.007)	0.004 (0.007)	0.002 (0.007)
>2 Semesters of Algebra	0.016† (0.010)	0.019† (0.010)	0.020* (0.010)	0.000 (0.010)	0.008 (0.010)	0.006 (0.010)
Took Trigonometry and/or Physics	0.016† (0.010)	0.018† (0.011)	0.019† (0.011)	-0.001 (0.008)	-0.004 (0.008)	-0.006 (0.008)
English (reference=8 Semesters)						
6-7 Semesters	-0.002 (0.013)	-0.002 (0.014)	-0.004 (0.014)	-0.005 (0.006)	-0.003 (0.007)	-0.005 (0.007)
<6 Semesters	-0.019 (0.028)	-0.023 (0.029)	-0.014 (0.029)	0.005 (0.012)	-0.001 (0.012)	-0.001 (0.012)
High School Rank (Reference=Bottom Quartile)						
Quartile 2 Category	0.007 (0.017)	0.014 (0.019)	0.014 (0.019)	0.005 (0.008)	0.002 (0.008)	0.001 (0.008)
Quartile 3 Category	0.018 (0.015)	0.017 (0.017)	0.017 (0.016)	0.002 (0.008)	-0.008 (0.009)	-0.007 (0.009)
Quartile 4 Category	0.014 (0.015)	0.012 (0.016)	0.012 (0.016)	0.026** (0.010)	0.017 (0.011)	0.017 (0.011)
Years of Schooling	0.004 (0.003)	0.004 (0.004)	0.004 (0.003)	0.004 (0.004)	0.006 (0.004)	0.006† (0.004)
Male	0.086*** (0.010)	0.083*** (0.011)	0.079*** (0.011)	0.093*** (0.007)	0.080*** (0.007)	0.085*** (0.007)

(continued)

	College Degree			No College Degree		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Parental SES	-0.001** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Big-Five Personality						
Extraversion		0.000 (0.001)			0.000 (0.001)	
Agreeableness		-0.001 (0.001)			-0.001 (0.001)	
Conscientiousness		-0.001 (0.001)			0.001† (0.001)	
Neuroticism		-0.002† (0.001)			-0.001 (0.001)	
Openness		0.002† (0.001)			0.001 (0.001)	
Ryff Scale Psychological Orientation						
Autonomy			0.000 (0.001)			0.000 (0.001)
Environmental Mastery			0.002 (0.001)			0.000 (0.001)
Personal Growth			0.003* (0.001)			0.001 (0.001)
Positive Relations with Others			-0.002* (0.001)			-0.001 (0.001)
Purpose in Life			-0.002 (0.001)			0.002** (0.001)
Self-acceptance			0.000 (0.001)			-0.001 (0.001)
Constant	0.678** (0.218)	0.714** (0.714)	0.685** (0.237)	0.536*** (0.072)	0.454*** (0.085)	0.425*** (0.080)
N=	1736	1540	1549	4364	3622	3667
LR chi² (df)	13.02(14)	9.07(19)	8.93(20)	25.69(14)	15.47(19)	15.77(20)
Probability > chi²	0	0	0	0	0	0

Note. Coefficients reported are from OLS regression estimates. Standard errors in parentheses.
† p < .10; * p < .05; ** p < .01; *** p < .001

Table 2-5
Logit Regression: Awareness of Pension Account Balances Regressed on Cognition, Educational Attainment, Academic Performance, Personality, and Ryff Scale Psychological Orientation; Wisconsin Longitudinal Study, 1957–2003/2005

	College Degree			No College Degree		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Cognition						
IQ Spline (70-90)	0.006 (0.005)	0.005 (0.005)	0.005 (0.005)	0.003* (0.002)	0.002 (0.002)	0.003 (0.002)
IQ Spline (90-120)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.004*** (0.001)	0.003** (0.001)	0.004*** (0.001)
IQ Spline (120+)	0.002 (0.002)	0.001 (0.002)	0.002 (0.002)	0.006 (0.005)	0.007 (0.006)	0.008 (0.006)
High School Academic Performance						
Algebra (reference = 2 Semesters)						
<2 Semesters of Algebra	0.042 (0.035)	0.034 (0.040)	0.046 (0.036)	-0.006 (0.017)	-0.009 (0.018)	-0.007 (0.018)
>2 Semesters of Algebra	0.025 (0.021)	0.025 (0.022)	0.031 (0.022)	-0.012 (0.028)	0.011 (0.028)	0.006 (0.029)
Took Trigonometry and/or Physics	0.000 (0.020)	0.007 (0.021)	0.008 (0.021)	0.038† (0.019)	0.030 (0.021)	0.032 (0.021)
English (reference=8 Semesters)						
6-7 Semesters	0.022 (0.027)	0.022 (0.029)	0.021 (0.029)	0.006 (0.016)	-0.001 (0.017)	0.002 (0.017)
<6 Semesters	-0.106 (0.088)	-0.127 (0.094)	-0.109 (0.091)	-0.005 (0.031)	-0.017 (0.034)	-0.010 (0.033)
High School Rank (Reference=Bottom Quartile)						
Quartile 2 Category	-0.019 (0.042)	-0.007 (0.043)	-0.020 (0.046)	-0.011 (0.020)	-0.007 (0.022)	-0.012 (0.022)
Quartile 3 Category	0.034 (0.030)	0.041 (0.031)	0.035 (0.032)	-0.028 (0.022)	-0.037 (0.024)	-0.038 (0.024)
Quartile 4 Category	-0.010 (0.032)	-0.003 (0.034)	-0.010 (0.034)	0.035 (0.024)	0.038 (0.025)	0.035 (0.025)
Years of Schooling	0.023** (0.008)	0.017* (0.008)	0.017* (0.008)	0.012 (0.009)	0.008 (0.010)	0.011 (0.010)
Male	0.177*** (0.026)	0.176*** (0.028)	0.177*** (0.028)	0.171*** (0.016)	0.161*** (0.017)	0.155*** (0.017)

(continued)

	College Degree			No College Degree		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Parental SES	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Big-Five Personality						
Extraversion		0.000 (0.002)			-0.003† (0.002)	
Agreeableness		-0.001 (0.002)			0.000 (0.002)	
Conscientiousness		-0.001 (0.002)			0.000 (0.002)	
Neuroticism		-0.005* (0.002)			-0.002 (0.002)	
Openness		0.004† (0.002)			0.004* (0.002)	
Ryff Scale Psychological Orientation						
Autonomy			-0.001 (0.002)			0.002 (0.002)
Environmental Mastery			0.001 (0.003)			-0.003 (0.002)
Personal Growth			0.006** (0.002)			-0.001 (0.002)
Positive Relations with Others			-0.003 (0.002)			-0.005* (0.002)
Purpose in Life			-0.004 (0.003)			0.004† (0.002)
Self-acceptance			0.004† (0.002)			0.001 (0.002)
N=	1423	1268	1274	3293	2796	2829
LR χ^2 (df)	151.13(14)	137.60(19)	142.35(20)	231.31(14)	202.19(19)	208.85(20)
Probability > χ^2	0	0	0	0	0	0

Note. Coefficients reported indicate the average marginal effects of the covariate on the outcome measure. Standard errors in parentheses.

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 2-6
Logit Regression: Awareness of Bank Account Balances Regressed on Cognition, Educational Attainment, Academic Performance, Personality, and Ryff Scale Psychological Orientation; Wisconsin Longitudinal Study, 1957–2003/2005

	College Degree			No College Degree		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Cognition						
IQ Spline (70-90)	0.004 (0.003)	0.005 (0.004)	0.004 (0.003)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
IQ Spline (90-120)	-0.001 (0.001)	-0.002 (0.001)	-0.002† (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
IQ Spline (120+)	0.000 (0.002)	0.000 (0.002)	0.000 (0.002)	0.005 (0.004)	0.004 (0.005)	0.004 (0.005)
High School Academic Performance						
Algebra (reference = 2 Semesters)						
<2 Semesters of Algebra	0.008 (0.033)	-0.003 (0.036)	-0.007 (0.037)	0.006 (0.012)	0.010 (0.013)	0.010 (0.013)
>2 Semesters of Algebra	0.025 (0.017)	0.031† (0.017)	0.033† (0.017)	-0.027 (0.020)	-0.016 (0.022)	-0.017 (0.022)
Took Trigonometry and/or Physics	-0.002 (0.016)	-0.004 (0.017)	-0.002 (0.017)	0.018 (0.014)	0.019 (0.015)	0.016 (0.015)
English (reference=8 Semesters)						
6-7 Semesters	-0.029 (0.026)	-0.026 (0.027)	-0.023 (0.026)	-0.015 (0.012)	-0.011 (0.013)	-0.011 (0.013)
<6 Semesters	-0.008 (0.051)	-0.012 (0.052)	0.004 (0.044)	-0.020 (0.022)	-0.022 (0.024)	-0.021 (0.024)
High School Rank (Reference=Bottom Quartile)						
Quartile 2 Category	-0.034 (0.034)	-0.043 (0.039)	-0.043 (0.038)	0.002 (0.014)	0.002 (0.015)	-0.001 (0.015)
Quartile 3 Category	0.017 (0.024)	0.008 (0.027)	0.009 (0.026)	0.000 (0.015)	-0.002 (0.016)	0.000 (0.016)
Quartile 4 Category	0.034 (0.026)	0.030 (0.027)	0.029 (0.027)	0.014 (0.017)	0.013 (0.019)	0.015 (0.019)
Years of Schooling	-0.005 (0.006)	-0.008 (0.006)	-0.008 (0.006)	0.009 (0.007)	0.006 (0.007)	0.007 (0.007)
Male	0.109*** (0.020)	0.108*** (0.021)	0.106*** (0.021)	0.082*** (0.011)	0.068*** (0.013)	0.077*** (0.013)

(continued)

	College Degree						No College Degree		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Parental SES	-0.001 (0.001)	-0.001* (0.001)	-0.001* (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Big-Five Personality Extraversion		0.000 (0.001)					-0.002* (0.001)		
Agreeableness		-0.001 (0.002)					-0.002† (0.001)		
Conscientiousness		-0.002 (0.002)					0.001 (0.001)		
Neuroticism		-0.002 (0.002)					-0.004*** (0.001)		
Openness		0.002 (0.002)					0.001 (0.001)		
Ryff Scale Psychological Orientation									
Autonomy			0.000 (0.002)						0.000 (0.001)
Environmental Mastery			-0.003 (0.002)						0.000 (0.002)
Personal Growth			0.005** (0.002)						0.001 (0.001)
Positive Relations with Others			-0.002 (0.002)						-0.003* (0.001)
Purpose in Life			0.000 (0.002)						0.001 (0.002)
Self-acceptance			-0.002 (0.002)						-0.001 (0.001)
N=	1779	1579	1588	4480	3725	3771			
LR chi ² (df)	65.710(14)	69.10(19)	82.06(20)	117.25(14)	110.90(19)	104.21(20)			
Probability > chi ²	0	0	0	0	0	0			

Note. Coefficients reported indicate the average marginal effects of the covariate on the outcome measure. Standard errors in parentheses.
† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

**ESSAY THREE: THE LINK BETWEEN FINANCIAL SELF-AWARENESS AND
FINANCIAL WELL-BEING IN LATER LIFE AS MEASURED BY
ACCUMULATED WEALTH**

Introduction

There is a consensus that households whose members are approaching retirement age are likely to be in need of more financial education and assistance in planning for retirement because of shifts in pension funding, investment, and longevity risks from employers to workers. In response, numerous programs and initiatives have been developed to promote financial literacy and provide financial education to U.S. consumers. However, there is little certainty about whether these efforts are actually affecting consumers' financial well-being (Caskey, 2006). More broadly, there is limited evidence regarding whether existing measures of financial literacy, which have pointed to low levels of financial literacy in the population as a whole and thus justification for these education programs, actually predict specific financial outcomes. Previous studies that employed existing measures of financial literacy sought to answer the research question: "Do individuals who are more familiar with financial concepts and more capable of calculating compound interest end up with more wealth in later life?" A potentially important, however ignored, question is: "Does 'financial self-awareness', i.e., individuals' attentiveness toward their financial assets situation, affect financial well-being in late life?" I discussed in essay 1 the controversies around the appropriate measures of financial literacy: Do the prevailing measures capture financial knowledge or behavior? Do they capture prerequisites or outcomes? I proposed a measure that captures

these multiple aspects of financial literacy. However, empirical evidence is needed to examine the implications of financial self-awareness for financial well-being. The purpose of this essay is to provide empirical evidence to show the consequences of being financial self-aware; in other words, whether financial self-awareness is predictive of retirement well-being as measured by wealth. I exploit the Wisconsin Longitudinal Study, a panel data set which because of its particular measures and measurements over time provided the advantage of allowing me to examine the relationship between financial self-awareness and wealth. This essay is meant to facilitate thinking regarding the development of educational offerings, based on the findings of whether financial self-awareness is associated with increased wealth. I find that one particular kind of financial self-awareness in earlier life—whether individuals have a clear picture and are able to provide precise values about their financial assets—is associated with accumulated wealth in later life, especially for individuals in the mid-to-lower range of wealth distribution. Individuals who have a good sense of their overall financial situation in their early 50s, and specifically individuals who are able to give answers when asked about the values of their financial assets at that time, have higher accumulated wealth in subsequent years, controlling for other factors correlated with both financial awareness and wealth. The results suggest that educating individuals about the importance of being aware of their financial conditions should be incorporated into the design of financial education programs. Recognizing the significance of financial self-awareness and developing the habit of keeping oneself financially self-aware is a mindset that should be formed early in life, a mindset that, I argue, would benefit individuals throughout their working lives, extending into their retirement years.

Literature Review

It remains a puzzle why households even with similar economic and demographic characteristics accumulate different amounts of wealth. Life-cycle models have been used favorably by researchers to attribute the wealth variation to differences in time preference rates, risk tolerance, exposure to uncertainty, relative tastes for work and leisure at advanced ages, and bequest motives (Bernheim, Skinner, & Weinberg, 2001; Venti & Wise, 2000). Nevertheless, little empirical support has been found for the view that divergent preferences and exposure to different economic risks explain much of the wealth variation. In what follows I review several possible mechanisms of how various factors lead to higher accumulated wealth, and at the end of the section I summarize with the mechanism the study is set to test on.

Cognition and Wealth

One explanation of the wealth variation is that divergent wealth is due to differences in cognitive ability. Indeed, previous research has found that cognitive ability is linked to wealth, wealth growth, and wealth composition (Banks & Oldfield, 2007; Lusardi & Mitchell, 2007; McArdle, Smith, & Willis, 2009). However, the mechanism leading from cognition to wealth remains unclear. Only a few studies have attempted to explore the mechanism between cognition and wealth. Benjamin, Brown and Shapiro (2006) examined the relationship between concurrent cognition and risk and time preference anomalies, and then examined the further relationship between specific cognitive skills and real-world financial behaviors, including asset accumulation and

financial market participation, that are themselves affected by preference anomalies. Their findings confirm the relationships both between cognition and preference anomalies, and between cognition and behavioral outcomes, therefore implying the mechanism from cognition to preference anomalies to asset accumulation and financial market participation. Taking an even more specific perspective to examine the relation between cognition and wealth, Lillard and Willis (2001) constructed an index measuring individuals' precision of probabilistic beliefs, and linked it to the portfolio choices and the growth rate of household net worth. They found that individuals with more precise probabilistic thinking are more willing to take risks and hold a higher fraction of risky assets, and are likely to enjoy higher growth in wealth. These studies provide insights into the relationship between cognition and wealth-related variables. However, these past studies did not incorporate the concept of financial literacy in any form into the discussion. Neither did they discuss the role of financial literacy in the cognition-to-wealth mechanism. In sum, none of the studies has considered the potential role of financial self-awareness in affecting wealth.

Psychological Factors and Wealth

In recent years scholars have started to appreciate the importance of personality factors as predictors of economic behavior (Austin, Deary, & Willock, 2001; Perugini & De Raad, 2001). This strand of literature provides additional insights into the factors that underlie individuals' motives to save or engage in other forms of financial behavior. For example, a study by Hershey and Mowen compared personality and knowledge of financial planning for their influence on pre-retirement savings tendencies (Hershey &

Mowen, 2000). Using two sets of personality inventories as main predictors, Nyhus and Webley (2001) found that personality factors such as emotional stability, autonomy, and extraversion were robust predictors of saving and borrowing behavior. Meanwhile, agreeableness, inflexibility, and tough-mindedness could explain certain types of saving depending on the saving categories (Nyhus & Webley, 2001). Another study conducted in Scotland examined whether personality and intelligence are significant predictors of economic behaviors related to the farming business. The researchers found that individuals who score high on personality traits such as extraversion, openness to experience, conscientiousness, and higher cognitive ability are more likely to show both production-oriented behavior and environmentally oriented behavior (Austin, et al., 2001). Although not necessarily focusing on personality factors as an influence on personal finance outcomes, studies of other economic behaviors suggest they could play an important role. These studies of the effect of psychological factors on economic behaviors do not use accumulated wealth as an outcome measure; however, they indeed imply links between personality traits and wealth.

Financial Literacy and Wealth

More recently, studies have tested the role of financial literacy and financial literacy education in explaining wealth accumulation. Two studies similarly examine whether and how financial literacy and financial literacy education affects wealth. Cole and Shastry (2009) demonstrated the causal link between education and financial market participation, and that cognitive ability increases financial market participation through the channels of personality, borrowing behavior, discount rates, risk-aversion, and the

influence of employers and neighbors, rather than through the channel of financial literacy education. In contrast, Behrman, Mitchell, Soo, and Bravo (2010) explored the combined roles of financial literacy and schooling in affecting wealth accumulation. They found both financial literacy and schooling attainment are strongly associated with wealth outcomes, with the additional finding that financial literacy has even larger effects on wealth than schooling when using an instrumental variables approach.

Gustman, Steinmeier, and Tabatabai (2010) chose to focus on the knowledge aspect of financial literacy, specifically pension and Social Security knowledge in discussing the relation between cognitive ability, in particular numeracy, and wealth. Using the Health and Retirement Study (HRS), they examined the inter-correlation among cognition, pension knowledge, pension and Social Security wealth, and other wealth. They confirmed the relation between cognition and wealth tested by previous studies. They further hypothesized that individuals who have pensions will have a greater understanding about the mechanics of saving and a greater appreciation of the need for retirement saving, and thus that wealth held outside of pensions should be related to knowledge of pensions. Nevertheless, they found no evidence in support of the hypothesis that numeracy influences wealth in whole or in part by affecting financial knowledge of one's pension plan. The effect of pension knowledge on wealth has not been confirmed. Is it another type of knowledge that acts as a mediator between cognition and wealth? Or is there something completely different in essence from knowledge per se, for example "financial self-awareness," that plays an important role in mediating the relation between cognition and wealth? One possible missing link could be that it is not knowledge as specific as knowledge of one's pension plan, but rather in a more general

form, for example financial self-awareness, that would affect wealth in a more subtle way.

Thus, prior research has not successfully revealed the way in which financial literacy relates to higher accumulated wealth. For one, prior studies only focused on the knowledge aspect of financial literacy. Secondly, they failed to account for cognition and psychological factors that might influence both financial literacy and wealth. In other words, there is an absence of a holistic discussion incorporating cognition, psychological factors, and financial self-awareness when examining the link between financial literacy and wealth. The purpose of the current study is to utilize the newly developed measure of “financial self-awareness” to discover whether it plays a role in determining the variation in wealth among other well-known wealth determinants, especially cognitive and psychological factors. The first order of business is to provide the rationale for why financial self-awareness should lead to more wealth.

Conceptual Framework

As illustrated in essay 1, the new measure of financial self-awareness is a comprehensive measure that incorporates knowledge, behavior, and dynamic aspects. It indicates the ability to come up with an answer to the asset value question which requires diligently paying attention to one’s financial situation, knowing where one stands financially at a given point in time. It reflects a mindset of caring about one’s financial situation and it is a precursor to pursuing further financial goals.

How does financial self-awareness impact accumulated wealth in later life? As illustrated in essay 1, one pathway could be that being financially self-aware is a form of

“implementation intention,” which is acquired through diligently monitoring assets and actively engaging in financial matters. Being financially self-aware means being conscientious and mindful at all times, allowing oneself to be precise and staying on top of one’s own financial situation. Maintaining and building assets therefore becomes an automatic mechanism if individuals have financial self-awareness.

Specifically, the measure of the percentage of asset categories for which respondents can provide values indeed has been adopted as a measure for financial self-awareness. Compared with other two measures of financial self-awareness measures discussed in essay 1 and essay 2, i.e. whether respondents know about the values of their private pension accounts and bank accounts, the measure of the percentage of asset categories has the most virtues. An important thing to keep in mind is that this self-awareness is measured by the percentage of asset “categories”, not the percentage of “values” in all assets owned. Implementation intention theory implies that it is the knowledge of the overall situation that matters. To apply this theory to the current study, it is this awareness of categories among which financial decisions can be made that triggers further planning and behaviors that are hypothesized to lead to higher wealth. For example, if an individual has four types of assets of very different values, it matters more if he/she knows the amounts in all, compared to someone who knows only the amount in assets of the greatest value. Knowing every piece in the puzzle matters since one with greater financial self-awareness across categories will be in better position to allocate and make adjustments among financial resources. At times reallocation of funds into or out of smaller valued categories may be the key to wealth growth.

Financial self-awareness as defined in this study also captures the dynamic aspect of financial knowledge, enabling comparison across time and individuals. Any measure of knowledge can only capture knowledge at one point in time. The “need to know” about financial assets changes over time either due to different life stages of individuals or due to the changes in policy environment. Accordingly, the salience of knowledge about particular types of individual assets might vary with age, as would how assets are allocated among categories. For example, individuals in their 40s might know very well about home equities and mortgage debts but less about the value of retirement resources, whereas individuals in their 60s might be more aware of how much is in their retirement plans accounts than other accounts. An individual aged 40 being unsure of the value of a retirement account may be judged less problematic than a 60-year-old individual who does not know the account on the verge of retirement. However, the implementation intention theory applied in this study implies that a 40 year old building housing wealth needs to be cognizant of retirement fund growth. Thus financial self-awareness as measured by percentage of asset categories for which values can be given has the ability to catch unawareness that might incur problems across various life stages, since it implies the individual’s attentiveness to all financial entities owned and being accumulated given current and future goals. It is important to note that this measure of financial self-awareness is intended to reflect an ongoing awareness of how plans may change and be implemented over time. . Therefore the measure of percentage of asset categories is chosen as a measure of financial self-awareness when studying relation to wealth in later life.

Furthermore, how does financial self-awareness differentiate itself from other conventional factors that influence wealth levels, including cognition, educational attainment, and psychological factors? Indeed, cognition, educational attainment, and psychological factors such as personality traits have been found to relate to economic outcomes in the literature. However, this study proposes that financial self-awareness may have its own and unique influence on accumulated wealth in addition to what was studied in previous literature. While cognition, educational attainment, and psychological factors might be significant factors that influence wealth, financial self-awareness has a unique place in explaining the variations in wealth. Financial self-awareness in earlier life may have prolonged effects on wealth well into retirement age. With this financially self-aware mindset guarded at all times one would be able to detect financial problems in a timely fashion, and also would be able to seize opportunities to build up financial assets through savings and investment activities. It can almost be considered as an automatic mechanism leading from being financially self-aware to asset building. This empirical study is intended to provide evidence that financial self-awareness in earlier life associates with the objective measure of wealth level in later life, as a way to validate this new measure of financial literacy.

Data and Method

In this empirical study, I used the Wisconsin Longitudinal Study (1957-2003-2005) to discover the role that financial self-awareness in earlier years plays in predicting variations in wealth across individuals in later years. I used one of the financial self-awareness measures developed in the previous essays. The description of the dataset and

the rationale for the construction of the financial self-awareness variables are included in essays 1 and 2. In what follows I specify the similarities and the differences between the financial self-awareness indicator in this essay and the indicators used in essay 2. I provide a justification for using financial self-awareness in earlier life as a key covariate in studying the impact on accumulated wealth. I also present detailed descriptions of the outcome variables and the confounding variables that need to be controlled for in order to address the potential endogeneity problem while using financial self-awareness to predict wealth. Endogeneity problems usually arise whenever there is a loop of causality between the independent and dependent variables of a model, where there is measurement error in the independent variable, or when there is any omitted variable that will potentially bias the core relationship of interest. It is important to keep in mind the potential endogeneity problems when choosing and interpreting the appropriate models for explaining the relationship between financial self-awareness and wealth. To account for the possible confounding effects of unobserved variables on both financial self-awareness and wealth, I took advantage of the comprehensive panel data structure and abundant information regarding individuals' demographic backgrounds and characteristics available in the Wisconsin Longitudinal Studies. Using two waves of WLS data (1992-1993 wave and 2003-2005 wave), this study examines whether the key covariate—financial self-awareness—contributes to the variation in accumulated wealth. In particular, by using financial self-awareness measures in the previous wave to explain variations in accumulated wealth in the later wave, while controlling for wealth in the previous wave, one can partially account for the effects of the potential unobserved factors. Moreover, by utilizing a wide range of characteristics variables that capture different aspects of the

respondents in a relatively homogenous sample in terms of birth cohort, race, education level, and geographic area correlates, I could mitigate the unobserved variable effects that might arise due to omitted variables that were potential confounders.

It should be noted that when considering which variables to be included as confounding variables in the wealth models, it is useful to draw references from the determinants of financial self-awareness in essay 2. The determinants of financial self-awareness are by default confounding variables in the awareness-to-wealth equations if they are suspected to correlate with wealth as well. For example, cognitive IQ and educational attainment are significant predictors of financial self-awareness. Meanwhile both variables are expected to have independent influence on wealth apart from their influence on financial self-awareness. If IQ and educational attainment are not included in the wealth models, the estimates of marginal effects of financial self-awareness will be biased. Therefore, IQ and educational attainment should be included as confounding variables in the models that use awareness to predict accumulated wealth. Variables and models for empirical analyses will follow.

Outcome Measure: Accumulated Wealth

The outcome of interest is wealth accumulated in late life, which is adopted from the total household net worth variable in the WLS 2003-2005 wave. The means, medians, and standard deviations of the raw and imputed values of the variables are summarized in Table 3-1. The WLS obtained detailed information on household assets from all sources since the 1992-1993 wave. I employed asset data from the most recent 2003-2005 wave, which has the most extended coverage of asset varieties. Asset data include real estate

value, farm, motor vehicles, IRAs/Keoghs, employer-provided pensions, life insurance policies, mutual funds, checking and savings accounts, bonds, CDs and other savings, investment, and personal debt. Table 3-1 summarizes the wealth measures used in this study. The raw mean household wealth in this sample is about \$700,000; however wealth has its well-known features of high variability and skewness, as the median is just \$325,000. Moreover, the raw household wealth measure is composed of complete reports only; thus, for example, if the respondent only reported the values of 7 out of 16 total assets, the amount shown in the raw measure is only the sum of those 7 assets. Therefore, the raw measure is well below the real wealth value. The solution is to use the imputed version of the total wealth. As shown in Table 3-1, the median imputed total household wealth is around \$450,000. In order to eliminate the effects of outliers, the final wealth measure utilized in the analyses is the imputed total household wealth excluding the extreme outliers that lie above or below three inter-quartile range (IQR) fence points.¹ The mean imputed household wealth excluding outliers is about \$600,000, while the median is \$431,000.

Wealth is frequently used as an outcome measure representing financial well-being, assuming that more wealth leads to increased overall well-being (Bender, 2004). Indeed, wealth is a stock variable, which represents the outcome of past consumption and saving decisions. Following the rationale provided in the conceptual framework, it is hypothesized that an individual's financial self-awareness will automatically lead to more wealth by facilitating the early detection of problems and their correction in a timely

¹ The presence of severe outliers is a common problem with wealth data, which create problems for many statistical techniques. In this study I defined an observation of wealth as a "severe outlier" if it lay more than 3 interquartile range (IQR) beyond the first or third quartile threshold.

fashion. Financially self-aware individuals are also more likely to seize opportunities to create more wealth. This should provide one more pathway leading to higher wealth than using financial literacy or other concept as a predictor. Due to the fact that the assets section in the 2003-2005 wave consists of information on 16 types of assets and debts, while in the 1992-1993 section it only consists of 11 types of assets and debts, I included in the 2003-2005 total household wealth measure the same set of asset types as those in the 1992-1993 total household wealth measure. I eliminated the measures of the cash value of an individual's own and spouse's life insurance policies from the original 2003-2005 total household wealth measure, as the 1992-1993 total household wealth measure does not include these measures. The elimination did not impact the general pattern of wealth distribution.

Key Covariate: The Measurement of Financial Self-Awareness in 1992-1993

In order to examine the association between the financial self-awareness in earlier life and accumulated wealth in later life, one particular measure is chosen from the earlier 1992-1993 wave of WLS to capture the extent to which individuals are financially self-aware regarding their financial lives. The measure is “percentage of asset categories that respondents are able to give exact values on” (abbreviated hereinafter as “percentage of asset categories 92”). It is calculated by counting the number of equity questions (which are derived from the combination of the assets and debts questions, with a maximum value of 7) that respondents provided values on, divided by the number of equities that respondents owned (which is the sum of the number of equities respondents provided

values on and the number of equities for which respondents answered “don’t know”).² For example, if a respondent reported having seven of the equity types asked about in the survey, and provided values when asked about the value of those assets for only four of the equity types, replying “don’t know” for the remaining three equity types, the “percentage of asset categories 92” for this respondent would be 4/7, or 57 percent. This measure was constructed in a similar way for the later wave (2003-2005). However, the 2003-2005 survey asks about 16 types of assets and debts, the 1992-1993 survey asks only about 11 types of assets and debts. One might hypothesize that with a more parsimonious asset section in the 1992-1993 wave (11 types of assets and debts rather than the later 16), respondents would be more likely to provide a value for assets owned, resulting in a higher score for the percentage of assets for which respondents provide values. As shown in Table 3-2, the mean of this “percentage of asset categories 92” is 92%, compared to a mean of 84% for the similar measure in 2003-2005. This could be one of the weaknesses of this financial self-awareness measure since the parsimonious structure of the survey from which this measure has derived results in sacrificing some of the heterogeneity in the score of “percentage of asset categories 92.” That said, this measure was intended to capture the level of awareness of his or her “current” financial situation that the respondent had when in his or her early 50s. The rationale for choosing this response as a measure of financial self-awareness follows the same logic as the other financial self-awareness measures introduced in the previous essays. One would assume that individuals who are more aware of their financial lives would pay more attention to their assets and debts, even well ahead of their retirement dates. If an individual has a

² See Appendix B for a reference of survey questions included in the asset section in the WLS.

clear picture of personal asset values in his early 50's, it means he or she at least has some basic sense of financial matters and therefore is financially self-aware. Knowing more of one's financial situation can be viewed as one of the prerequisites of further planning, enabling individuals to plan for other aspects of their financial lives accordingly. On the other hand, if an individual knows little about his or her financial assets, it implies little awareness of what is happening in his or her financial life. Therefore, knowing and being able to provide values on one's financial assets can be considered as a form of financial self-awareness. Note that I included in the analysis sample only those cases where the full series of asset questions was completed. Respondents who refused to answer at least one asset question comprised about 12 percent of the sample and were excluded from the analyses.

Confounding Covariates

This set of variables includes those that, if excluded, would lead to biased estimates of the influence of the previous major covariate. It was hypothesized that individuals equipped with financial self-awareness regarding their overall financial situation and day-to-day finances will be able to accumulate larger amounts of wealth than the non-aware into their retirement years. But if one fails to control for other characteristics that are correlated with both financial self-awareness and wealth, the predicted effects of financial self-awareness on wealth might be biased. Using the Wisconsin Longitudinal Studies, this study has the advantage of having access to an extensive list of socio-economic and demographic variables that can be controlled for in multivariate wealth regressions, resulting in a cleaner estimate of the effect of awareness

on wealth. In addition, the longitudinal nature of the dataset also enables control for wealth in the previous wave so that most of the inherent or historical factors can be accounted for. In what follows I explain the reasons for choosing these covariates that might be confounding, requiring particular attention, and thus be included in the models.

Childhood IQ. It is critical to control for cognitive ability when looking at the relationship between financial awareness and wealth, since previous studies have demonstrated that IQ predicts financial literacy level, and is also directly related to wealth (Banks & Oldfield, 2007; McArdle et al., 2009). These scores, available through matched school district administrative records, are derived from the Henmon-Nelson Test of Mental Ability, which was administered to high school students in Wisconsin. I employed the scores measured in high school (in 1957), not IQ in late life, in order to capture the effect of early life baseline cognitive abilities that are likely to enhance the ability of individuals over their lifetimes to read about, understand, rigorously critique, and act on complex information, which in turn presumably affect both financial awareness and wealth.

Educational attainment. This measure contains a set of dummy variables to represent the highest degree attained by respondents since high school graduation. The degrees range from high school, associate degree, bachelor's degree, master's degree, and PhD/professional degree. For this age group, the majority (about 70%) of the sample population had high school graduation as their highest attainment. About 27% of the sample finished college and had a bachelor's degree. However comparing to the general

population in the nation, this group of WLS individuals had a relatively high educational level: all of them are high school graduates. It has been documented repeatedly that educational attainment is linked to financial literacy and wealth. The results from the previous essay also show correlations between educational attainment and the measures of financial self-awareness. Thus educational attainment is a confounder that needs to be taken account for.

Parental socioeconomic status. It is critical to control for parental socioeconomic status in models because it may predict both awareness level and wealth. The parental socioeconomic status measure is a WLS-created factor-weighted score ranging from 1 to 97. The score is based on: (1) the highest number of years of schooling for the respondent's mother and father, 2) the Duncan SEI occupational score for the respondent's father's occupation, and (3) the four-year average of parental income between 1957 and 1960, based on Wisconsin tax records.

Psychological characteristics. Psychological characteristics are found to be significant predictors of financial self-awareness, as illustrated in essay 2. Furthermore, psychological orientation variables should be treated as confounding variables, for they are enduring individual characteristics that generally reflect genetic endowments and earlier life experiences (Behrman, et al., 2010), which can be assumed not only to affect one's financial self-awareness level, but also to affect wealth directly or indirectly. I control for the Ryff scale variables from the 1992-1993 survey, including autonomy, environmental mastery, personal growth, positive relations with others, purpose in life,

and self-acceptance. The former two are important factors with the reasons being that environmental mastery and autonomy closely align with one's sense of control. Self-acceptance in the Ryff scale is an alternative to self-esteem, which previous research has found to have a direct, positive relationship to wages (Goldsmith, Veum, & Darity, 1997); therefore, it needs to be controlled for.

Poor health. A positive relationship between wealth and health has been found in numerous studies. A study by Michaud and van Soest (2008) further found strong evidence of causal effects from both spouses' health on household wealth, but no evidence of causal wealth-to-health effects, using dynamic panel data models. The focus in this study is the influence of health on wealth. Causal pathways from health to wealth can be explained in a health production framework (Grossman, 1972). The possible mechanisms are as follows: Health and health expectations can affect productivity, hourly wages, and labor supply, thus driving retirement decisions and the capacity to accumulate savings for retirement. Moreover, health directly affects expenditures, especially for those not covered by health insurance and/or for whom copayments and additional health costs are substantial (Smith, 2005). The vast amount of health expenditures could be detrimental to wealth. Given that health status is such a major determinant of wealth, and given also its potential influence on an individual's overall mindset on financial matters, it should be taken into account when examining the relationship between financial self-awareness and wealth. I constructed a measure of "poor health" based on self-reported health, where "poor health" equaled "1" if the respondent rated their current health in 1992-1993 as "fair" or "poor," and "0" if rated "good," "very good," or "excellent."

Union status and government employment status. Rather than using the common control for occupation used in most wealth models, I controlled for respondent's union status and government employment status in my analyses. It is crucial to include union status (whether the individual belongs to a union or not) and government employment status (whether the respondent works for the federal, state, or local government) as additional controls in the models, since the two statuses are usually highly associated with the offer of defined benefit plans. They can act as a proxy for whether the respondents depend mainly on defined benefit plans for financial resources in retirement. For this age group of individuals, unionized firms in certain industries and government agencies were highly correlated with pension provisions (e.g. defined benefit plans) and health insurance coverage. However, union/government status might have two distinct effects on the financial self-awareness level. On one hand, individuals belonging to a union or employed by the government might have greater awareness of pensions and negotiations over financial issues since they have already been offered and possess certain pension plans and therefore are obligated or motivated to know more about their financial situations. But on the other hand, it could be that individuals with defined benefit pensions are disengaged from the management of their retirement plans in general, thus being unaware of their financial assets situation. They do not feel the need to become more familiar with the details of their plans, probably not until they are very near their retirement ages. There is evidence that possession of defined benefit plans is associated with reduced wealth accumulation (Ameriks, Caplin, & Leahy, 2003). Thus, the relationship between financial self-awareness in earlier life and accumulated wealth

might be biased by whether a respondent has a primary defined benefits plan. By controlling for union status and government employee status, which are indicative of the possession of defined benefits plans, one can have a clearer idea of what the real relationship is between financial self-awareness and wealth in later life. Two dummy variables were created based on two status questions, respectively. For union status, the variable was coded “1” if the respondent answered yes to the question, “Do/did you belong to a labor union in your current/last job?” and “0” otherwise. For government employee status, the variable was coded “1” if the respondent confirmed employment with any level of government by answering the question “Was or is your last or current job with Federal, State, or Local Government?” and “0” otherwise. Both variables were derived from the 1992-1993 wave data.

Other demographics. This set of measures controls for sex, marital status, number of children, and retirement status in 1992-1993. They are familiar variables from standard life-cycle regressions and wealth models. In the current study they also act as confounders that might lead to biased estimates of the influence of the key covariates if excluded. For example, gender has been found to be a significant predictor of both financial self-awareness (as illustrated in essay 2) and wealth. Men have been repeatedly found to score higher on financial self-awareness measures and possess higher accumulated wealth than women. Though not tested specifically, it is hypothesized that marital status plays an important role in affecting financial self-awareness, as it does in determining wealth. The number of children in the household in mid-life years could possibly affect the decision on financial assets distribution among family members,

which could motivate one to know his or her financial situation better. If an individual is partially or completely retired in his or her fifties, which is considered rather early, it is somewhat indicative of how well they have an understanding of their overall financial picture. One could also argue that some individuals generally do not actively collect information and become financially self-aware until they are seriously considering retirement. Moreover, the decision to retire at such an early age might itself be wealth-related.

Total household income and net worth in 1992-1993. The controls for total household income and net worth are needed in the quantile regressions where the dependent variable is total net worth in 2003-2005. The total net worth measured in the 1992-1993 wave serves as a baseline measure accounting for any unobserved historic characteristics that affect one's wealth level. Moreover, putting this variable on the right-hand side of the equation estimating current wealth basically is a way of examining the change in wealth between the two waves that are separated by ten years.

Models

Essay 2 found that personality traits and psychological characteristics have independent effects on financial self-awareness in late life. However, they do not mediate much of the relationship between cognition and financial self-awareness. As a step forward, in the study for essay 3 I tested the hypothesis that being financially aware in earlier life has an independent influence on accumulated wealth in late life. Specifically the research question was: *What difference does financial self-awareness in earlier life*

(1992-1993) make in terms of wealth accumulation in later life (in 2003-2005)? Prior studies have shown that financial literacy, planning, and schooling are significantly correlated with positive financial outcomes (Ameriks, et al., 2003; Behrman, et al., 2010; Lusardi & Mitchell, 2007). However, no study has yet incorporated the concept of financial self-awareness into the equations.

The purpose of this study was first and foremost to incorporate the concept of financial self-awareness, to examine what difference financial self-awareness in earlier life makes in influencing whether individuals accumulate more or less wealth in late life. Building upon the discussions and empirical results from the previous two essays, the empirical models for this essay were constructed as follows. To account for the well-known features of high variability and right skewness distribution of wealth, quantile regressions were estimated. Wealth models were estimated for all individuals in the sample, and separately for college graduates and non-college graduates. All models included financial self-awareness in 1992-1993 as the key predictor, plus the key covariates described above, including cognition, educational level, parental socioeconomic status (SES), marital status, number of children, retirement status, health status, and total household income. To be specific, I used the indicators of union membership and government employee status to account for variations due to occupation. An important addition to the existing lists of variables is the psychological factors that were added to the model. Psychological characteristics are considered non-cognitive human capital that is suspected to have an impact on economic behavior and wealth (Goldsmith, et al., 1997; Heckman, Stixrud, & Urzua, 2006; Perugini & De Raad, 2001). Yet few studies have attempted to use psychological factors as key covariates when

examining accumulated wealth. I employed Ryff scale psychological characteristics in the wealth models to help explain the variations in wealth that could not be captured by other factors. Lastly, economic variables such as total household income and total household wealth in the previous wave of 1992-1993 were included in the models as controls to account for possible unobserved effects from historical factors.

Furthermore, sequential regression models were used to examine whether and how cognition, education, and psychological factors affect the basic relationship between financial self-awareness and wealth. Model 1 establishes the basic relationship between “percentage of asset categories 92” and accumulated wealth in 2003-2005, controlling for other factors except cognition, education, and psychological characteristics. Model 2 consists of regressions with existing predictors of total household wealth in 2003-2005 from the basic model, plus cognition measured by IQ splines. Model 3 further adds in educational attainment controls, and model 4 adds in Ryff Scale psychological characteristics. Adding in one key factor at a time helps detect whether cognition, educational attainment, and psychological characteristics alter the relationship between financial self-awareness and wealth, or even completely account for the effect of financial self-awareness on wealth.

Results

The summary sample characteristics are shown in Table 3-2. “Percentage of asset categories 92” has a relatively high mean of 92%, meaning that on average respondents reported values for 92 percent of the types of assets held. It is surprising to see that in this age group 11% of the sample said that they were partially or completely retired. As

mentioned earlier, respondents of the WLS sample were relatively well-educated and economically sufficient with a median income of \$60,500.

Relation of Total Wealth in 2003-2005 to Financial Self-Awareness in 1992-1993

The financial self-awareness measure in 1992-1993: percentage of asset categories for which respondents gave amounts, is significantly and positively related to the accumulated wealth in 2003-2005, especially for those at the lower part of the wealth distribution, controlling for other factors. The positive relationships are found both for individuals with college degrees and without college degrees; however, the magnitude of influence is larger for the former, and the level of significance higher for the latter.

I started with OLS regressions in preliminary analyses, using net worth in 2003-2005 as the outcome variable. “Percentage of asset categories 92” had a negative but non-significant effect on the accumulated wealth level in 2004. This is a somewhat unexpected and counterintuitive finding given the expectation that individuals who know more about their assets situation earlier in life should be managing their financial lives better, resulting in higher accumulated wealth. This finding might be due to the extreme values and the skewed distribution of the wealth measure. Wealth has the well-known features of high variability and right skewness distribution, which are observed in the WLS sample as well. In this WLS sample mean household wealth is about \$900,000, and the median is about \$456,000. Even when excluding the extreme outliers that lie above or below three interquartile range (IQR) fence points, mean household wealth is still \$600,000, while the median is \$431,000. Several models have been utilized to correct for these issues. The first attempt was to delete extreme outliers and re-run the OLS

regressions. “Percentage of asset categories 92” showed minor positive effects on wealth for 2003-2005 wave; however, this effect was found for only the non-college graduates samples.

Major findings emerged with adoptions of quantile regressions to address misleading outlier effects. The results for the first quartile from quantile regressions are shown in Table 3-3. It shows that the estimated effect of “percentage of asset categories 92” on the conditional first quartile of wealth in 2003-2005 wave was positive for both individuals with college degrees and without college degrees, and particularly statistically significant for those without college degrees. For all individuals combined, a one percentage point increase in the awareness of asset levels measure is associated with about a \$600 increase in later wealth, while higher cognitive ability, higher educational attainment, and being married still have their expected positive effects on wealth. Men are significantly wealthier than women, as well as individuals with parents with higher socioeconomic status. In terms of psychological factors, autonomy surprisingly is negatively related to accumulated wealth, while the positive relation to self-acceptance is as hypothesized. For the college graduates, a one percentage point increase in the awareness of asset levels measure is associated with about a \$1,000 increase in later wealth. For this group, gender and parental socioeconomic status were the only other significant predictors of wealth.

More interesting results were observed for those without college degrees. For the non-college graduates sample, a one percentage point increase in the awareness of asset levels measure is significantly associated with about a \$600 increase in later wealth. Moreover, cognitive ability is also significantly related to accumulated wealth.

Demographic factors mostly have significant relationships with wealth as expected, with male, higher parental SES, and being married positively associated with more wealth. Autonomy and self-acceptance are the two psychological factors that are significantly related to wealth, with an opposite direction of impact.

What is the magnitude of these effects of the psychological human capital variables? In relative terms, standardized coefficients (as included in Table 3-3) demonstrate that the psychological factors have similar magnitude of influences on wealth accumulation in later life as cognitive factors and financial self-awareness level do. The effects of psychological characteristics such as autonomy, environmental mastery, and self-acceptance on wealth accumulation are comparable to the effects of cognitive abilities including IQ level and educational attainment, as well as comparable to the effects of the financial self-awareness measure. These results reiterate the importance to take psychological factors into account when examining the relationship between financial self-awareness and later life wealth accumulation.

Table 3-4 presents the results of the sequential regressions of accumulated wealth on awareness of asset levels and other key factors for the college graduates sample. The first column lists the coefficients from the basic relationship between the “percentage of asset categories 92” financial self-awareness measure wealth for 2003-05, controlling for other factors. The second column lists the coefficients from model 2 where child IQ measures have been added. The effect of financial self-awareness falls from \$1,200 to about \$850 in wealth per one percentage point increase in awareness after controlling for cognition, though neither effect is significant. With the inclusion of educational attainment as a control in model 3, the effect of financial self-awareness is reduced

further, though the effect remains small and non-significant. However, when psychological factors are included in the full model, the coefficient estimate of “percentage of asset categories 92” rises to around \$1,200. This implies that psychological factors are suppressing some of the effects from financial self-awareness. When psychological factors relate to wealth and financial self-awareness in opposite ways, they suppress the true effects from financial self-awareness on wealth if not being accounted for. Take one of the psychological factors— “autonomy” for example: while one would assume that individuals scoring higher on the autonomy scale also are more financially self-aware, this attribute is found to be negatively related to wealth. The fact that autonomy is negatively linked to wealth might be due to more autonomous individuals having more confidence in making their own decisions, including investing and borrowing behavior, which may contribute to lower wealth. One previous study on personality and economic behavior found that autonomy is a robust predictor of borrowing behavior (Nyhus & Webley, 2001). By controlling for the psychological factors such as autonomy in the full model, it helps reveal the unbiased relationship between the key covariate “financial self-awareness” and wealth.

Table 3-5 lists the results of the sequential regression models for those without college degrees. Model 1 establishes the baseline relationship between “percentage of asset categories 92” and wealth in 2003-05. The magnitude of influence from awareness is apparently smaller than for the college sample. On the other hand, the marginal effects of marital status and health status are significantly larger than for those with college degrees. Being married significantly increases the accumulated wealth by about \$80,000 compared to those never married, while self-reported poor health associates with about a

\$45,000 decrease in later wealth. The columns for models 2 and 3 report coefficient estimates with cognition and educational attainment variables included. Cognition and education do not seem to affect the basic relationship between awareness and wealth on any significant level. The interesting findings are from the full model 4. When the Ryff scale psychological characteristics are included in the model, the marginal effect of awareness of asset levels increases and becomes significant. The marginal effect goes from a \$413.46 to a \$614.81 increase in wealth per one percentage point increase in percent of assets reported. Meanwhile, cognition, psychological characteristics, and demographic factors retain their independent effects on wealth. The results imply that while cognition, education, and psychological factors help explain more variation in wealth, they also help reveal the true relation between financial self-awareness and accumulated wealth. In effect, financial self-awareness has its own contribution in explaining the heterogeneity in wealth.

It is worth mentioning that for the quantile regressions conducted in this study, the link between financial self-awareness and accumulated wealth becomes negative for the median wealth and above.³ The estimated negative effects increase when moving up towards higher quantiles in the total wealth distribution. Moreover, the negative effects are larger for college graduates than for non-college graduates. One thing to keep in mind is that this WLS sample is a relatively well-educated sample and comparatively wealthy. The median household wealth in 2004 is \$431,000 in this WLS sample, whereas the median household wealth is just under \$200,000 in 2006 in a HRS (Health and Retirement Study) for a similar cohort (McArdle, et al., 2009). On the other hand, the 25th

³ See tables in Appendix C, D, E for the 50th, 75th and 90th quantile regressions.

percentile of total wealth in this WLS sample is about \$215,000, which is about the same level as the median household wealth in the HRS sample previously mentioned.

Therefore, the estimated positive effect of overall asset knowledge on later life wealth appears only in the lowest wealth quartile in the analysis, and can arguably be applied up to the median wealth households in other populations.

The quandary is then why overall asset knowledge is not positively correlated with accumulated wealth for wealthier households. First, wealthier individuals are more likely to refuse to provide precise asset values on the assets they own by answering “don’t know,” or simply refusing to answer. Non-responses on financial measures are disproportionately high among those with very high asset levels (Juster and Smith 1997). A similar phenomenon happened with this WLS sample. The simplest evidence can be gathered from the summary statistics in Table 3-1. The imputed total household wealth in 2003-05 for the portion of the sample with any refusals to the asset questions is higher than the 2003-05 total wealth measures for the whole sample on every level, including mean, median, and other percentiles. Since for the 1992-93 wave WLS did not use the bracketing technique to elicit more information from respondents who answered “don’t know” or refused to answer initially, there might be more individuals falling into the “don’t know” or “refuse to answer” categories, comparing to the 2003-05 wave. Increasing the number of “don’t knows” or “refuses” per individual results in a lower score of overall asset knowledge for 1992, calculated by the number of assets that have reported values divided by the number of assets owned. On the other hand, the imputed wealth in 2004 is used as the outcome variable in the wealth models. The imputations provide the estimated wealth level for those who have missing values of wealth, due to

indicating either “don’t know” or “refuse.” Even though current analyses exclude the “refusals” to any of the asset questions in 1992, which is intended to avoid deflating the score of asset knowledge (as measured by percentage), there might still be a considerable number of wealthier individuals who answered “don’t know” as a polite way to refuse. In that case, these individuals have a low score of overall asset knowledge, but at the same time their imputed wealth were presumably high in amounts as measured in 2003-2005 wave. As a result, for higher percentiles in the wealth distribution, lower asset knowledge in 1992-1993 is associated with higher accumulated wealth in 2003-2005; thus the counterintuitive findings.

Second, another possible explanation is that the wealthier groups of individuals were already entering into the assets decumulation stages according to life-cycle hypothesis (Ando & Modigliani, 1963). One could argue that those who accumulated higher wealth earlier in life are able to enjoy a longer secure retirement, decumulating assets in their 60s, while lower savers have to accumulate longer. Individuals with higher wealth might have different consumption and savings patterns that other groups at this near retirement age, therefore the observed negative relationship between financial self-awareness level and accumulated wealth in later life.

Indeed, one other possible explanation is that the wealthier individuals really do not know very well the minor facts of their each and every asset, contributing to the negative relationship between asset knowledge and later wealth. One possible scenario could be that a person with a more complex portfolio would be more challenged to know all asset values precisely, while someone with only a checking account would more likely score high on the percentage of asset values known to be variable. A situation like this

would result in findings that overall asset knowledge correlates negatively with later wealth. Indeed I tested this possible scenario by estimating separate retirement preparedness models for individuals who have four or fewer types of assets, and individuals who have more than four types. In this sample the majority of respondents had four types of assets in 1992, followed by three or five. Among those who had more than five assets, the more they knew, the less likely they would be retirement-unprepared later on. Another scenario could be that wealthier individuals hire professionals to monitor and manage their assets for them since their asset values have become too large to be easily traced. Ironically the wealthiest are the least financially self-aware as defined in this dissertation.

Individuals with negative wealth might behave differently from the rest of the sample which consists of those with positive wealth. To address the issue of negative wealth values, I estimated Tobit regressions. I replaced all the negative values with zeros and ran a Tobit. The results from simple models only including asset knowledge and gender as predictors still showed a large negative relationship between asset knowledge and wealth in 2004. Another issue of negative wealth values might arise by excluding the refusals. It might be that individuals with negative wealth (that is, debts) tend to refuse to answer, and therefore are excluded from the sample of the analysis, sacrificing some of the variations in the outcome variable.

Another possible explanation for the finding that there is only a non-significant relationship between “percentage of asset categories 92” and wealth level in 2003-05 for the relatively wealthier individuals can be found in the composition of predictor variables. As discussed in essay 2, cognitive human capital such as IQ and educational

attainment, and non-cognitive human capital such as personality traits and psychological characteristics all contribute to the variation in the level of financial self-awareness. I performed tests using robust regressions, starting with the bivariate relationship between asset knowledge in 1992 and accumulated wealth in 2004, adding in one control variable at a time, in an attempt to tease out which control variable alters the initial relationship between asset knowledge and wealth. The first several rounds of models show positive relationships between asset knowledge and wealth, controlling for income, wealth in 1992, and demographic variables. However, when IQ and educational attainment are added to the model, the marginal effects of asset knowledge drop significantly. Thus, the inclusion of cognitive human capital in the wealth model might dilute the marginal effect of asset knowledge. Secondly, related literature suggests that the estimated effects of most cognitive and non-cognitive variables on total wealth increase when moving up the total wealth quantiles (McArdle, et al., 2009). Accordingly, as we move up the total wealth quantiles, the effect of asset knowledge on wealth could be overwhelmed by other predictors of wealth.

Whichever possible explanations suffice, these findings do not undermine the value of this financial self-awareness measure in examining the relationship to accumulated wealth. The critical finding of this study is that the degree to which one cares about his or her financial situation earlier in life does relate to wealth accumulation in later life. Suffice to say that financial self-awareness measured by the overall financial picture of one's assets is a reasonable financial literacy measure that is indicative of accumulated wealth, at least for individuals in the lower wealth distribution. However, results also show a difference in behavior at different wealth levels. It is important to

keep in mind that “percentage of asset categories for which values given” is only one aspect of financial literacy. One needs to be cautious when using “the percentage of asset categories for which values provided” as a financial self-awareness measure.

Sensitivity Analysis

In an attempt to further investigate the relationship between the awareness of asset levels financial self-awareness measure and the financial outcomes in 2003-05, I conducted a sensitivity analysis that modifies the economic covariates included in the model. In the original analyses, in order to control for potential unobserved historic characteristics that affect one’s wealth level, I controlled for both total household income and total household wealth in the previous wave of 1992-93. However, since the financial self-awareness measure “percentage of asset categories 92” was calculated based on the reports in the same survey section as total household wealth, there might be a multicollinearity problem if both “percentage of asset categories 92” and total household wealth in 1992-93 were included in the models. Thus, in the sensitivity analysis I removed wealth in 1992-93 from the models, while keeping the income variable in the models as a control for the economic factor. The relationships between financial self-awareness and accumulated wealth in 2003-05 remained the same with the alterations of the models.

Conclusions and Implications

The main findings of this study are that earlier life financial self-awareness, specifically the awareness of owned asset levels, indeed has a relationship to late-life

accumulated wealth, particularly for those at the lower end of the wealth distribution. This finding corresponds to the assertion that financial self-awareness represents a mindset reflecting general skills that might benefit older and younger cohorts alike, as long as it enables adaptation to changing financial circumstances. In this research for this essay I estimated quantile regressions to identify the impact of this financial self-awareness indicator in earlier life on accumulated wealth in later life, controlling for other factors that have been found to have effects on wealth and that might bias the influence of financial awareness on wealth. Prior studies have linked financial literacy with positive financial outcomes; however, their choice of knowledge-based only or behavior-based only financial literacy measures in the first place might have led to misleading results. Secondly, previous studies failed to control for unobserved factors that might have shaped both financial self-awareness and wealth outcomes. They also neglected the possibility that what is important about financial literacy is just a mindset, a relatively constant set of general skills, and this mindset in earlier life might affect retirement well-being in later life. I took advantage of the panel nature of the WLS to be able to examine the possible effects of previous, already existing financial self-awareness on wealth accumulation in later life. I also included psychological characteristics in the models to account for uncharted unobserved effects. In all three essays I assert that it is the “awareness” that matters most to improving financial well-being, compared to other knowledge-specific or behavior-specific financial educational efforts.

The effects of knowledge of one’s overall financial picture on wealth varied across sample groups. The significant effects of this overall awareness measure on accumulated wealth were mostly confined to those in the lower part of the wealth

distribution, and to those without a college degree. A likely explanation for the results is that at the lower end of the wealth distribution, the asset profiles are usually simpler; thus how well one knows about his or her financial situation is more indicative of real financial literacy skills. In addition, the observed effects for this subsample are less likely to be subject to the exclusion of refusals. For those without a college degree, cognitive abilities play an important role in explaining the variation both in financial self-awareness and wealth, with positive relationships to both. By controlling for cognitive abilities, the true relationship between financial self-awareness and wealth is better revealed for this group of individuals. In general, the results provide support to the assertion that financial self-awareness has its own indicative ability for some mindsets related to wealth, above and beyond cognition, education, and even psychological characteristics. It is important to keep in mind that, as stated at the beginning of this dissertation, financial self-awareness is a prerequisite for making good financial decisions; nevertheless, having complete knowledge of one's existing financial situation does not guarantee good financial outcomes. However, at the least financial self-awareness can serve as a signal for potential retirement unpreparedness. In other words, if a person does not have a decent idea of his or her overall financial situation, this might be indicative of bigger problems such as negligence in managing their own finances, not making reasonable financial decisions, and consequently being unprepared for their retirement.

Another caveat to this study that should be addressed regards sample selection. All of the analyses excluded those who refused to answer. It is reasonable to suspect that those who refused to answer any financially related questions are likely to have characteristics that are correlated with the wealth-related outcome variables. It is well

known that wealthier individuals may be less likely to report their wealth, and indebted individuals may be less likely to report their debts. I incorporated these possibilities when explaining why I did not find significant relationships between knowing one's financial assets and accumulated wealth. It is important to consider the effects from those refusals when interpreting the measures and results.

In general, the findings speak to the importance of the concept of financial self-awareness, which could be an indicator of general skills that facilitate individuals adapting to a changing financial environment. It could also be a warning signal for the financially unaware that they might endanger themselves into more serious financial consequences. Policy makers and consumers should make efforts to promote and maintain financial self-awareness. The development of educational materials must focus on the salient needs of the targeted audience and engage those it wishes to inform. The educational context currently available can be either too specific or too generic and exercises can be either too rudimentary or too advanced to engage the intended audience. One could suggest promoting individuals' financial self-awareness and encouraging consumers to pay attention to their surrounding financial situation. Moreover, just being exposed to financial education itself can arouse financial self-awareness. These could be among the effective means of promoting greater financial security.

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Table 3-1
Summary Statistics for Total Household Wealth, Wisconsin Longitudinal Study

Variable	Year, Source	Mean	Median	St. Dev.	Min.	Max.	Number of Observations
Dependent Variables							
Total Household Wealth(Complete Report Only)	2003/2005	\$708,211	\$325,000	\$2,277,317	-\$1,672,500	\$114,000,000	6933
Imputed Total Household Wealth	2003/2005	\$920,172	\$456,000	\$2,449,833	-\$8,659,688	\$114,000,000	6933
Exclude Any Refusal to Asset Question	2003/2005	\$911,082	\$453,100	\$2,532,705	-\$1,168,025	\$114,000,000	6101
Imputed Total Household Wealth, exclude outliers ^a	2003/2005	\$605,546	\$431,000	\$562,584	-\$1,168,025	\$2,945,015	6617

Note: Individuals that responded both the 1992/1993 and 2003/2005 survey are included in the sample for the analyses.
^aThe dependent variables used in analyses exclude wealth outliers that lie outside of the fences 3 IQR away from the mean.

Variable	Year, Source	Mean/%	Range	St. Dev.
Key Covariate				
Percent of Asset Type for Which Value Given ^a	1992/1993	92.1	0-100	18.4
Confounding Covariates				
<i>Cognitive Human Capital</i>				
Childhood IQ	1957	101.7	61-145	14.5
<i>Psychological Human Capital</i>				
Ryff Scale Psychological Characteristics Measures				
Autonomy	1992/1993	31.2	4-42	5.7
Environmental Mastery		33.6	2-42	5.5
Personal Growth		33.0	2-42	5.9
Positive Relations with Others		33.9	4-42	5.9
Purpose in Life		33.8	1-42	6.1
Self-Acceptance		32.9	2-42	6.3
<i>Demographic variables</i>				
Male		45.7		
Parental Socioeconomic Status	1957	16.0	1-87	10.9
Educational Attainment				
High school degree	1992/1993	71.0		
Associate degree		2.8		
Bachelor's degree		15.6		
Master's degree		8.3		
Doctoral/Professional degree		2.3		
Marital Status				
Married	1992/1993	83.3		
Divorced/Separated		10.2		
Widowed		2.4		
Never Married		4.1		
Number of Kids	1992/1993	3.0	0-14	1.7
Retired	1992/1993	11.3		
Poorhealth	1992/1993	10.8		
Union Member	1992/1993	22.4		
Government Employee	1992/1993	21.7		
Total Household Income (imputed)	1992/1993	\$78,555		\$245,928
Total Household Wealth (imputed)	1992/1993	\$261,231		\$397,450
<i>Note.</i> The descriptives statistics of the covariates are based on the sample with respondents answered both 1992/1993 and 2003/2005 wave, and excluding wealth outliers.				
^a The sample size for analysis is 5929, excluding refusals to any asset question.				

Table 3-3
Relationship of Accumulated Total Household Wealth in 2003/2005 to Awareness of Asset Levels in 1992/1993 -- 25th Quantile Regression;
Wisconsin Longitudinal Study, 1957-2003/2005

	All		College Degree		No College Degree	
	Coef.	St. Coef.	Coef.	St. Coef.	Coef.	St. Coef.
Financial Self-Awareness Measures						
Percent of Asset Type for Which Value Given	602* (306)	0.000	1213 (808)	0.010	615* (302)	0.005
Cognition						
IQ Spline (70-90)	1821 (1412)	0.004	6409 (8157)	0.012	2250^ (1238)	0.004
IQ Spline (90-120)	1411* (642)	0.006	1751 (1698)	0.008	1277* (645)	0.006
IQ Spline (120+)	-666 (1876)	-0.001	3035 (3205)	0.004	-4166 (2912)	-0.005
Educational Attainment ^a						
Associate Degree ^b	-20099 (31232)	-0.001			-14192 (26406)	-0.001
Bachelor's Degree	24811 (15623)	0.004				
Master's Degree ^c	39938* (20291)	0.004	-4554 (30908)	-0.001		
Doctoral/Professional Degree	209395*** (36235)	0.014	63599 (52613)	0.008		
Male	28241* (11543)	0.006	60254^ (31772)	0.012	25598* (11450)	0.005
Parental SES	2127*** (519)	0.010	3255** (1090)	0.015	1648** (584)	0.007
Marital Status (Never married is the reference group)						
Married	73109** (27712)	0.012	54987 (59595)	0.009	66382* (31389)	0.010
Divorced/Separated	5818 (30879)	0.001	17927 (67397)	0.002	-6847 (34426)	-0.001
Widowed	21201 (45446)	0.001	62043 (112151)	0.004	10006 (47717)	0.001

(continued)

Table 3-3 (continued)

	All		College Degree		No College Degree	
	Coef.	St. Coef.	Coef.	St. Coef.	Coef.	St. Coef.
Number of Kids	-7213* (3387)	-0.005	4197 (9896)	0.003	-7255* (3223)	-0.005
Retire	-34534* (16474)	-0.005	855 (52363)	0.000	-32618* (15319)	-0.004
Poorhealth	-26223 (17275)	-0.003	-46593 (54775)	-0.007	-24664 (16087)	-0.003
Union Member	-8521 (13591)	-0.001	26689 (38563)	0.005	-13760 (13334)	-0.002
Government Employee	-15688 (13939)	-0.003	-17028 (33689)	-0.003	-15569 (14622)	-0.003
Total HH Income in 92 (imputed)	0.65*** (0.05)	0.070	1.60*** (0.21)	0.172	0.28*** (0.04)	0.030
Total HH Wealth in 92 (imputed)	0.59*** (0.01)	0.185	0.58*** (0.04)	0.180	0.60*** (0.01)	0.187
Psychological Well-being						
Autonomy	-2173^ (1149)	-0.005	-2919 (3068)	-0.007	-2423* (1126)	-0.006
Environmental mastery	2307 (1550)	0.005	2110 (3994)	0.005	2608^ (1544)	0.006
Personal growth	-1355 (1297)	-0.003	-1337 (3726)	-0.003	-1215 (1245)	-0.003
Positive relations with others	-1496 (1303)	-0.003	-930 (3397)	-0.002	-1887 (1289)	-0.005
Purpose in life	75 (1501)	0.000	1143 (4091)	0.003	410 (1462)	0.001
Self-acceptance	3085* (1387)	0.008	4330 (3574)	0.011	2966* (1383)	0.008
Constant	-217292^ (129461)	-0.244	-864009 (729681)	-0.213	-223973^ (115819)	-0.234
N=	4878		1380		3485	
Pseudo R2	0.17		0.18		0.15	

(continued)

	Model 1	Model 2	Model 3	Model 4
Financial Self-Awareness Measures				
Percent of Asset Type for Which Value Given	1200 (808)	841 (749)	767 (773)	1213 (808)
Cognition				
IQ Spline (70-90)		8605 (7455)	5289 (7833)	6409 (8157)
IQ Spline (90-120)		2397 (1585)	2190 (1628)	1751 (1698)
IQ Spline (120+)		2635 (2971)	3920 (3071)	3035 (3205)
Educational Attainment				
Master's Degree (Bachelor's degree is the reference)			-1373 (29544)	-4554 (30908)
Doctoral/Professional Degree			70471 (50448)	63599 (52613)
Male	67420* (29333)	69456* (27112)	59086* (28502)	60254* (31772)
Parental SES	3023** (1085)	2896** (1013)	2889** (1046)	3255** (1090)
Marital Status (Never married is the reference group)				
Married	58948 (59642)	38195 (55153)	49050 (56695)	54987 (59595)
Divorced/Separated	21621 (67812)	-5647 (62659)	2779 (64403)	17927 (67397)
Widowed	2519 (109819)	-716 (101447)	19241 (107510)	62043 (112151)
Number of Kids	2797 (10024)	761 (9261)	981 (9482)	4197 (9896)
Retire	17683 (52997)	-11889 (49003)	-13205 (50276)	855 (52363)
Poorhealth	-70263 (54881)	-83167 (50824)	-69416 (51822)	-46593 (54775)
Union Member	25595 (38342)	27045 (35541)	28401 (36857)	26689 (38563)
Government Employee	-26007 (33374)	-18497 (30864)	-16580 (32270)	-17028 (33689)
Total HH Income in 92 (imputed)	1.59*** (0.21)	1.60*** (0.19)	1.54*** (0.20)	1.60*** (0.21)
Total HH Wealth in 92 (imputed)	0.61*** (0.04)	0.62*** (0.03)	0.61*** (0.03)	0.58*** (0.04)
Psychological Well-being				
Autonomy				-2919 (3068)
Environmental mastery				2110 (3994)
Personal growth				-1337 (3726)
				(continued)

Table 3-4 (continued)				
	Model 1	Model 2	Model 3	Model 4
Positive relations with others				-930 (3397)
Purpose in life				1143 (4091)
Self-acceptance				4330 (3574)
Constant	-161316 [^] (95126)	-920385 (662897)	-620926 (696857)	-864009 (729681)
N=	1401	1401	1382	1380
Pseudo R2	0.17	0.18	0.18	0.18
<i>Note.</i> The sample is based on respondents who answered both 1992/1993 and 2003/2005 wave, excluding wealth outliers and matching asset types in the two waves. Coefficients reported are from quantile regression estimates. Standard errors in parentheses. Model 1 is the baseline; model 2 adds in cognitive factors; model 3 adds in educational attainment; model 4 adds in Ryff Scale measures.				
[^] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$				

	Model 1	Model 2	Model 3	Model 4
Financial Self-Awareness Measures				
Percent of Asset Type for Which Value Given	445 (321)	444 (313)	413 (314)	615* (302)
Cognition				
IQ Spline (70-90)		2319^ (1282)	2236^ (1285)	2250^ (1238)
IQ Spline (90-120)		1170^ (663)	1236^ (665)	1277* (645)
IQ Spline (120+)		-2911 (3025)	-2965 (3030)	-4166 (2912)
Educational Attainment				
Associate Degree (High school graduates is the reference)			-3799 (27448)	-14192 (26406)
Male	19174 (11829)	27995* (11486)	28612* (11511)	25598* (11450)
Parental SES	1713** (615)	1441* (604)	1426* (606)	1648** (584)
Marital Status (Never married is the reference group)				
Married	80826* (33697)	71920* (32591)	71434* (32646)	66382* (31389)
Divorced/Separated	3309 (36876)	-8728 (35671)	-9307 (35729)	-6847 (34426)
Widowed	22940 (51260)	5414 (49595)	5552 (49674)	10006 (47717)
Number of Kids	-8086* (3451)	-8323* (3341)	-8172* (3349)	-7255* (3223)
Retire	-32127* (16395)	-35551* (15872)	-35307* (15898)	-32618* (15319)
Poorhealth	-45361** (16899)	-42631** (16352)	-43488** (16379)	-24664 (16087)
Union Member	-10585 (14264)	-18414 (13826)	-18100 (13854)	-13760 (13334)
Government Employee	-7172 (15642)	-5930 (15136)	-4698 (15170)	-15569 (14622)
Total HH Income in 92 (imputed)	0.30*** (0.04)	0.28*** (0.04)	0.28*** (0.04)	0.28*** (0.04)
Total HH Wealth in 92 (imputed)	0.62*** (0.02)	0.60*** (0.01)	0.60*** (0.01)	0.60*** (0.01)
Psychological Well-being				
Autonomy				-2423* (1126)
Environmental mastery				2608^ (1544)
Personal growth				-1215 (1245)
Positive relations with others				-1887 (1289)
				(continued)

Table 3-5 (continued)				
	Model 1	Model 2	Model 3	Model 4
Purpose in life				410 (1462)
Self-acceptance				2966* 1383
Constant	6388 (44015)	-192986^ (115347)	-183865 (115551)	-223973^ (115819)
N=	3498	3498	3495	3485
Pseudo R2	0.14	0.15	0.15	0.15
<p><i>Note.</i> The sample is based on respondents who answered both 1992/1993 and 2003/2005 wave, excluding wealth outliers and matching asset types in the two waves. Coefficients reported are from quantile regression estimates. Standard errors in parentheses. Model 1 is the baseline; model 2 adds in cognitive factors; model 3 adds in educational attainment; model 4 adds in Ryff Scale measures.</p> <p>^ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$</p>				

GENERAL CONCLUSIONS AND IMPLICATIONS

The purposes of this study are to introduce the concept of “financial self-awareness”, to validate its usefulness in financial capability research, and to examine whether financial self-awareness makes any difference in retirement well-being. The study was guided by the implementation intention framework, and thus posited that financial self-awareness can be viewed as an implementation intention, a mindset that reflects an individual’s willingness and being actively engage in his or her financial affairs, which enables the realization of simple if-then financial plans, and that hence may aid in the achievement of the long-term goal of wealth accumulation. This study contributes to the financial literacy literature for validating financial self-awareness as an important and separate measure from existing financial literacy measures. It suggests a new way of thinking (i.e. the concept of financial self-awareness) in exploring the channel connecting financial literacy and retirement well-being measured by wealth.

Summing up the three essays, this study provides evidence that financial self-awareness is a distinct measure from current measures of literacy. First, financial self-awareness as measured by the knowledge of individual financial resources reflects a mindset of diligent caring of one’s financial situation, which, according to implementation intention theory, would presumably trigger beneficial behaviors thus leading to higher accumulated wealth in later life. It is intended to capture a mindset that not only reflects knowledge of financial assets, monitoring and other behaviors required attention, but also something else that is essential to the financial capability of managing one’s financial life. Findings from the empirical study in essay 3 support the proposition

that financial self-awareness, which captures something else than just knowledge and behavior, indeed is associated with later life wealth accumulation particularly for those who have limited to moderate economic resources.

Second, the measure of financial self-awareness focuses on knowledge of “own” financial resources, turning the attention toward financial matters inward. Unlike some existing financial literacy measures that evaluate individuals’ financial capabilities by normative, pre-set standards (e.g. whether one knows well certain economic concepts or investment instruments; whether one engages in certain financial management practices), financial self-awareness captures the knowledge regarding one’s own financial situation, measuring knowledge and behavior without the “normative” aspect of what individuals should be knowing/doing to be “financially literate.” In a world where savings decisions are increasingly left to individuals, knowledge that is relevant to one’s own situation is the one that matters most. Financial self-awareness is such a measure that reclaims the importance of autonomy in deciding one’s financial well-being. In what follows I provide a review on how the concept of financial self-awareness has been adopted in each essay, and the contributions of each essay in this study.

Essay 1 provided a justification for why financial self-awareness matters and how it differs from existing measures of financial literacy. It concluded that financial self-awareness measured by how well individuals know about their currently owned financial assets is a consolidated measure that reflects knowledge, behavior, and the dynamic aspects of financial literacy. It is derived from individuals’ knowledge of their own financial assets, ranging from day-to-day financial resources such as bank accounts, and private pension plans that accumulate an amount balance, to the overall picture of their

current financial situation, all of which are intended to represent the general knowledge and mindset necessary for managing their financial lives. It also reflects financial behavior involving constant monitoring and being alert to one's assets situation. This financial self-awareness concept is expected to be complementary to existing financial literacy measures.

Utilizing three financial self-awareness measures and motivated by human capital theory (Becker, 1962; Heckman, Stixrud, & Urzua, 2006; Mincer, 1962), the results in essay 2 demonstrate that certain personality traits and psychological orientations such as neuroticism, openness to experience, and a sense of personal growth not only independently relate to late-life financial self-awareness above and beyond the effect of cognitive abilities and other early life factors, but also indirectly mediate the relationship between early-life cognitive human capital and late-life financial self-awareness, especially for those with college degrees. Through the process I validated, financial self-awareness is a supplementary measure to current financial literacy measures, and not only a proxy for cognition or personality.

In essay 3, utilizing the overall awareness measure of individuals' current financial situation, I examined the link between being financially self-aware in earlier life and retirement well-being, measured by wealth accumulation. I found that individuals who are more financially self-aware in the ways I measure that status, that is, having a clear sense of their financial assets situation and paying attention to it, have higher accumulated wealth in late life, particularly for those at the lower to middle end of the wealth distribution. This is a particularly important finding, since it implies that financial self-awareness could be used to identify what populations appear to be in danger of

lacking financial capabilities and therefore most in need of financial education, which might be more of a concern among lower to middle wealth population. The WLS sample is a relatively wealthy and highly educated sample, which represents two-thirds of the same cohort in the general population in the U.S. (Wisconsin Longitudinal Study website). The significant association between financial self-awareness and wealth accumulation found in the first quartile of the WLS sample gives some indication of what that relationship may look like among households with median to lower wealth level in the general population. Through financial education and well-targeted interventions promoting financial self-awareness and raising the awareness level across the life course, it is expected that individuals would be better equipped for reaching their goals in order to improve financial well-being in later life.

One of the virtues of this new measure of financial self-awareness for financial literacy and capability is its adaptability and applicability. The concept of financial self-awareness can be easily adopted with different datasets in various financial literacy studies. In the way I measured the concept, financial self-awareness is captured by the knowledge of financial resources and the realization of a mindset that reflects the degree to which an individual cares about his/her own financial situation. Other measures of financial knowledge that have more detailed information of financial matters, for example, knowing the composition of the investment portfolio, and knowing what types of assets and debts are included in the asset holdings, might very well be able to capture other aspects of one's financial self-awareness level. Candidate variables might be readily available in most national datasets that contain a survey section asking about respondents' assets and debts and other variables relating to financial matters. National

datasets such as the Health and Retirement Study (HRS), Survey of Consumer Finances (SCF), the Panel Study of Income Dynamics (PSID), and Survey of Income and Program Participation (SIPP) all consists of rich information on income, expenditures, assets and liabilities of individuals and households in the United States.

“Whether one knows the values of particular assets owned” and “the percentage of asset categories for which respondents can provide values” are only two examples of measures that can capture the concept of financial self-awareness, arguably the most straightforward and the best available in the Wisconsin Longitudinal Study. An ideal measure to capture the concept of financial self-awareness might be a measure that could provide more concrete evidence of individuals’ awareness and be able to differentiate individuals’ awareness level. Matching the self-reported data with administrative data on respondents’ financial entities might increase the accuracy and validity of the self-awareness measure. A more detailed knowledge measure covering different levels/categories of financial entities, or even a combination of knowledge - knowing the situation - and the subsequent behavioral responses - further planning behaviors that are triggered by the knowledge – might be helpful in creating more depth and variations into the self-awareness measure. A financial literacy module has been added to the newest wave of Wisconsin Longitudinal Study in 2011. The module contains knowledge-based financial literacy measures. It is of interest to see whether results vary if knowledge-based measures are employed when examining the link between financial literacy and wealth. If the results do vary between using the financial self-awareness measure and using the knowledge-based measure as a predictor to wealth, it helps articulate the distinctiveness of this financial self-awareness measure that it is indeed capturing

something different from which the conventional financial literacy measures can capture.

Another contribution of this study is the emphasis on the “don’t know” answer in the survey. Most researchers tend to ignore the “don’t know” categories when analyzing survey data. However, this study signifies the importance of the “don’t know” categories since they provide abundant information themselves. This is especially true when the measures intend to capture respondents’ knowledge of their own situation. “Don’t know” represents a negligent mindset toward one’s situation, in this case financial situation, which might have negative impacts or even detrimental consequences to financial well-being as suggested by the findings of this study. Incorporating “don’t know” categories when analyzing knowledge variables provides a different view of using survey data that could be of use in other areas of studies.

There are some caveats and limitations to this study that should be addressed. First, WLS is a homogenous sample of white Wisconsin high school graduates from 1957. This is a relatively well-educated sample and thus has relatively high levels of financial self-awareness as measured in essay 2 and relatively high levels of wealth as observed in essay 3. Thus, these analyses cannot tell us how those without high school degrees fare, in terms of their level of financial self-awareness level and the relationship between awareness and wealth. Nevertheless the link between lower cognitive scores and financial self-awareness gives some indication of what that relationship may look like for a less educated population.

Another caveat regards the sample selection issue due to refusals. All of the analyses excluded those who refused to answer. While in essay 2 the exclusion of refusals does not seem to bias the basic patterns of findings, it poses some problems in

essay 3, where I discussed the counterintuitive findings on the negative relationship between financial self-awareness and wealth among the wealthiest. While it is clearly stated that the purpose of introducing financial self-awareness is not to use it to predict wealth, one should still pay more attention when interpreting the results when there are refusals that are potentially caused by wealth-related factors.

The final caveat is that while I found associations between cognitive abilities, personality, and late-life financial self-awareness, as well as earlier financial self-awareness and later wealth, I cannot claim these are entirely causal relationships. However, the childhood cognitive abilities and earlier life measures such as personality and psychological orientations are prospective, and in some cases (like for cognition) based on administrative data. In the wealth equations I controlled for earlier wealth and attempted to account for historical effects and potential confounders. So the study does provide a unique contribution for understanding the links between early-life factors and late-life outcomes.

There are several interesting research questions that remained unanswered. In terms of outcome measures for retirement well-being, future research could explore the link between financial self-awareness in earlier life and subjective psychological well-being in late life. Financial well-being can be measured in various ways, and wealth is one of the most frequently used outcome measures representing financial well-being, assuming that more wealth leads to increased overall well-being (Bender, 2004). Subjective well-being on the other hand can capture something different than the objective measure of wealth. For one, as mentioned earlier, some individuals may be very well aware of their low assets situation, though they may be leading a simple life and thus

still feel satisfied with their well-being. Or they may have intended to live with a higher debt-to-asset ratio with only a sustainable wealth level. They could be financial self-aware, without this being reflected in higher wealth. These are the scenarios that my study cannot capture. Survey questions such as “To what extent are you satisfied with your present financial situation?” are a possible way to capture this subjective well-being and provide a clearer picture of this relationship.

A further step could be examining the research question: Do individuals equipped with better financial self-awareness cope better after a substantial life crisis due to an unexpected personal event (such as unemployment, loss of spouse, or a health decline)? The current study established a basic link between financial self-awareness and the objective financial measure of wealth. A next step could be using alternative outcome measures such as subjective financial satisfaction, happiness in late life, or sufficient financial resources to maintain one’s lifestyle for the remaining years of life.

In general, this study validates the view that financial self-awareness is an important and separate measure from existing financial literacy measures. It represents a mindset of willingness and effort to attend to one’s financial affairs, which complements other financial literacy measures in understanding the pathway to financial security. While targeted interventions later in life are likely effective, this study emphasizes the importance of more general skills, which are achieved through schooling and cognitive investment in early life and perhaps in mid-life as well. The specific skills needed to manage finances effectively have changed dramatically over time and will continue to change. Having general skills and financial self-awareness that enable adaptation to changing financial circumstances are likely critical for financial well-being.

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Appendix A

Assets Questions in the Wisconsin Longitudinal Study, 2003/2005 Wave

The next section covers different types of assets that you or your spouse may have, such as real estate, motor vehicles and financial investments.

Do you own your own home, or are you renting?

- How much do you think your home would sell for now?
- How much, if anything, do you owe on your home?

Do you own a business or farm?

- How much would your business or farm sell for now?
- How much, if anything, do you owe on your business or farm?

Do you own any other real estate, (such as a second home, land, rental real estate, a real estate partnership, or money owed to you on a land contract or mortgage)?

- How much do you think this other real estate would sell for now?
- How much, if anything, do you owe on your other real estate?

Next, we would like to know about any motor vehicles you may have. These would include cars, trucks, campers, boats, airplanes, and other RVs. Thinking of all your motor vehicles together, would you say they are worth more than \$1,000 or less than \$1,000?

- Altogether how much would these vehicles sell for now?
- How much, if anything, do you owe on these vehicles?

Do you owe a total of \$5,000 or more for anything other than what we have already talked about? (such as, for credit cards, installment loans, overdue bills, and personal loans for schooling or other purposes.)

- Altogether how much do you owe on all your debts other than mortgages, car, and business loans?

The next questions ask about a number of different kinds of savings or investments you may have. First we will ask you about retirement savings, then about banking accounts, next about saving bonds and certificates of deposit, and finally about your stock or bond market investments.

Some people have retirement plans that accumulate an ACCOUNT BALANCE -- these are things like IRA's, 401k's and profit sharing plans. Do you (or your husband/wife) have any plans like this?

- If you added up all such accounts, about how much would they amount to right now?

Do you (or your husband/wife) have more than \$1,000 or less than \$1,000 in checking accounts, savings accounts, or money market funds?

- If you added up all such accounts, about how much would they amount to right now?

Aside from anything you have already told me about, do you (or your husband/wife) have any money in CDs, Government Savings Bonds, or Treasury Bills?

- If you added up all such accounts, about how much would they amount to right now?

(Aside from anything you have already told me about, do you (or your husband/wife) have any money in/What about) stocks, bonds, or shares in a mutual fund?

- If you sold all of these and paid off anything you owed on them, about how much would you have?

(Aside from anything you have already told me about, do you (or your husband/wife) have any money in/What about) any other savings or assets? (Such as jewelry, money owed to you by others, a collection for investment purposes, rights in a trust or estate where you are the beneficiary, or an annuity.)

- If you sold all that and paid off any debts on it, about how much would you have?

Do you, yourself, have any life insurance, including individual or group policies?

Are any of these life insurance policies that build up a cash value (that you can borrow against, or that you would receive if the policy were to be canceled)?

- What is the total CASH VALUE of these policies? (The CASH VALUE of a policy is what the insurance company would pay if the policy were canceled before death.)

Does your (husband/wife) have any life insurance, including individual or group policies?

Are any of these life insurance policies that build up a cash value (that your (husband/wife) can borrow against, or that (he/she) would receive if the policy were to be canceled)?

- What is the total CASH VALUE of these policies? (The CASH VALUE of a policy is what the insurance company would pay if the policy were canceled before death.)

Appendix B

Assets Questions in the Wisconsin Longitudinal Study, 1992/1993 Wave

Do you own your own home, or are you renting?

- How much would your home sell for now?
- How much do you owe on your home?

Do you own any other real estate?

- How much would your other real estate sell for now?
- How much do you owe on your other real estate?

Do you own a business or farm?

- How much would your business or farm sell for now?
- How much do you owe on your business or farm?

Do you own any motor vehicles?

- Altogether how much would these vehicles sell for now?
- How much do you owe on these vehicles?

Do you owe \$5,000 or more for anything other than mortgages, vehicles, or real estate that we have already talked about?

- How much do you owe on all your debts other than mortgages, car, and business loans?

About how much is the total value of your/you and your spouse's savings?

About how much is the total value of your/you and your spouse's investments?

Appendix C			
Relationship of Accumulated Total Household Wealth in 2003/2005 to Awareness of Asset Levels in 1992/1993			
-- 50th Quantile Regression; Wisconsin Longitudinal Study, 1957–2003/2005			
	All	College Degree	No College Degree
	Coef.	Coef.	Coef.
Financial Self-Awareness Measures			
Percent of Asset Type for Which Value Given	-262	527	-199
	(363)	(853)	(364)
Cognition			
IQ Spline (70-90)	1928	6697	2639^
	(1676)	(8619)	(1491)
IQ Spline (90-120)	1116	3025^	1047
	(761)	(1794)	(776)
IQ Spline (120+)	905	1237	-3167
	(2226)	(3386)	(3506)
Educational Attainment ^a			
Associate Degree ^b	-7608		-11387
	(37062)		(31794)
Bachelor's Degree	76731***		
	(18539)		
Master's Degree ^c	62863**	-32061	
	(24079)	(32658)	
Doctoral/Professional Degree	364027***	231386***	
	(42999)	(55592)	
Male	31362*	68748*	26418^
	(13698)	(33571)	(13786)
Parental SES	2266***	2907*	1792*
	(616)	(1152)	(704)
Marital Status (Never married is the reference group)			
Married	82789*	60468	79875*
	(32885)	(62969)	(37793)
Divorced/Separated	36376	56573	22460
	(36643)	(71213)	(41450)
Widowed	14201	34599	6455
	(53929)	(118502)	(57453)
Number of Kids	-7344^	897	-10028**
	(4019)	(10457)	(3881)
Retire	-41968*	33087	-50335**
	(19549)	(55328)	(18445)
Poorhealth	-43799*	-73975	-37854*
	(20500)	(57876)	(19369)
Union Member	-2485	71993^	-11899
	(16128)	(40747)	(16055)
Government Employee	-36917*	-96112**	-17296
	(16541)	(35597)	(17606)
Total HH Income in 92 (imputed)	1.32***	1.85***	0.80***
	(0.06)	(0.22)	(0.05)
Total HH Wealth in 92 (imputed)	1.08***	1.10***	1.04***
	(0.02)	(0.04)	(0.02)
			(continued)

Appendix C			
<i>(continued)</i>			
	All	College Degree	No College Degree
	Coef.	Coef.	Coef.
Psychological Well-being			
Autonomy	-2567 [^] (1363)	-2899 (3242)	-2881* (1356)
Environmental mastery	3319 [^] (1839)	3575 (4221)	3093 [^] (1859)
Personal growth	-1408 (1539)	-1596 (3937)	-590 (1498)
Positive relations with others	-2292 (1547)	-452 (3589)	-1733 (1552)
Purpose in life	1203 (1782)	1840 (4323)	1522 (1760)
Self-acceptance	1679 (1646)	1362 (3777)	1044 (1666)
Constant	-126464 (153626)	-727635 (771001)	-157950 (139450)
N=	4878	1380	3485
Pseudo R2	0.25	0.26	0.27
<i>Note.</i> The sample is based on respondents who answered both 1992/1993 and 2003/2005 wave, excluding wealth outliers and matching asset types in the two waves. Coefficients reported are from quantile regression estimates. Standard errors in parentheses.			
^a High school degree is the reference group for the whole sample.			
^b High school degree is the reference group for non-college sample.			
^c Bachelor's degree is the reference group for college and above sample.			
[^] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$			

Appendix D			
Relationship of Accumulated Total Household Wealth in 2003/2005 to Awareness of Asset Levels in 1992/1993			
-- 75th Quantile Regression; Wisconsin Longitudinal Study, 1957–2003/2005			
	All	College Degree	No College Degree
	Coef.	Coef.	Coef.
Financial Self-Awareness Measures			
Percent of Asset Type for Which Value Given	-1306*** (393)	-584 (1280)	-1670** (576)
Cognition			
IQ Spline (70-90)	1618 (1815)	-7323 (12933)	2322 (2362)
IQ Spline (90-120)	1191 (824)	3704 (2692)	534 (1230)
IQ Spline (120+)	-5100* (2411)	-3995 (5081)	-4099 (5556)
Educational Attainment ^a			
Associate Degree ^b	-22562 (40138)		-19582 (50382)
Bachelor's Degree	131782*** (20078)		
Master's Degree ^c	95664*** (26077)	-41844 (49005)	
Doctoral/Professional Degree	423356*** (46569)	231369** (83418)	
Male	56724*** (14835)	103316* (50374)	37850^ (21846)
Parental SES	3965*** (667)	4576** (1728)	3418** (1115)
Marital Status (Never married is the reference group)			
Married	101850** (35614)	167035^ (94487)	77584 (59890)
Divorced/Separated	69178^ (39685)	183522^ (106858)	42133 (65684)
Widowed	59735 (58406)	85345 (177815)	54909 (91042)
Number of Kids	-13384** (4352)	-5286 (15690)	-12635* (6150)
Retire	-54960** (21172)	-7467 (83021)	-54714^ (29228)
Poorhealth	-44088* (22202)	-98229 (86845)	-43455 (30693)
Union Member	-53320** (17467)	72148 (61142)	-48156^ (25441)
Government Employee	-49420** (17914)	-169306** (53415)	-31701 (27899)
Total HH Income in 92 (imputed)	2.44*** (0.06)	2.89*** (0.33)	2.21*** (0.08)
Total HH Wealth in 92 (imputed)	1.39*** (0.02)	1.32*** (0.06)	1.45*** (0.03)
			<i>(continued)</i>

Appendix D			
<i>(continued)</i>			
	All	College Degree	No College Degree
	Coef.	Coef.	Coef.
Psychological Well-being			
Autonomy	-3475*	-5114	-2851
	(1477)	(4864)	(2148)
Environmental mastery	987	48	767
	(1992)	(6333)	(2947)
Personal growth	167	-2807	346
	(1667)	(5907)	(2375)
Positive relations with others	-3057 [^]	-3000	-2919
	(1675)	(5385)	(2459)
Purpose in life	1666	6600	-53
	(1930)	(6487)	(2789)
Self-acceptance	3858*	4744	4917 [^]
	(1783)	(5667)	(2639)
Constant	41439	705618	53451
	(166379)	(1156907)	(220980)
N=	4878	1380	3485
Pseudo R2	0.32	0.30	0.29
<i>Note.</i> The sample is based on respondents who answered both 1992/1993 and 2003/2005 wave, excluding wealth outliers and matching asset types in the two waves. Coefficients reported are from quantile regression estimates. Standard errors in parentheses.			
^a High school degree is the reference group for the whole sample.			
^b High school degree is the reference group for non-college sample.			
^c Bachelor's degree is the reference group for college and above sample.			
[^] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$			

Appendix E		
Relationship of Accumulated Total Household Wealth in 2003/2005 to Awareness of Asset Levels in 1992/1993		
-- 90th Quantile Regression; Wisconsin Longitudinal Study, 1957–2003/2005		
	College Degree	No College Degree
	Coef.	Coef.
Financial Self-Awareness Measures		
Percent of Asset Type for Which Value Given	-4852**	-3669***
	(1912)	(931)
Cognition		
IQ Spline (70-90)	9497	2644
	(19310)	(3817)
IQ Spline (90-120)	731	-843
	(4020)	(1987)
IQ Spline (120+)	-9791	-1871
	(7587)	(8978)
Educational Attainment ^c		
Associate Degree ^d		-11668
		(81408)
Master's Degree ^e	12664	
	(73169)	
Doctoral/Professional Degree	364721**	
	(124550)	
Male	106667	23072
	(75213)	(35300)
Parental SES	4785 [^]	4723**
	(2580)	(1802)
Marital Status (Never married is the reference group)		
Married	173058	44611
	(141077)	(96770)
Divorced/Separated	142117	7679
	(159548)	(106133)
Widowed	-29532	-49627
	(265494)	(147107)
Number of Kids	-12917	-8918
	(23427)	(9938)
Retire	11200	-106780*
	(123958)	(47227)
Poorhealth	-117160	-60369
	(129668)	(49594)
Union Member	45837	-68377 [^]
	(91290)	(41108)
Government Employee	-280747***	-76304 [^]
	(79753)	(45080)
Total HH Income in 92 (imputed)	3.73***	2.92***
	(0.50)	(0.13)
Total HH Wealth in 92 (imputed)	1.20***	1.76***
	(0.08)	(0.04)
		(continued)

Appendix E		
<i>(continued)</i>		
	College Degree	No College Degree
	Coef.	Coef.
Psychological Well-being		
Autonomy	-6656 (7263)	-1737 (3471)
Environmental mastery	5678 (9456)	-427 (4761)
Personal growth	120 (8820)	155 (3837)
Positive relations with others	-8350 (8041)	-7766* (3973)
Purpose in life	7450 (9686)	-523 (4506)
Self-acceptance	3433 (8461)	6468 (4265)
Constant	-9137 (1727365)	532149 (357062)
N=	1380	3485
Pseudo R2	0.31	0.31
<i>Note.</i> The sample is based on respondents who answered both 1992/1993 and 2003/2005 wave, excluding wealth outliers and matching asset types in the two waves. Coefficients reported are from quantile regression estimates. Standard errors in parentheses.		
^a High school degree is the reference group for the whole sample.		
^b High school degree is the reference group for non-college sample.		
^c Bachelor's degree is the reference group for college and above sample.		
[^] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$		