

Risk Management for the Future: Age, Risk, and Choice Architecture

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0106

The Asian Conference on Psychology & the Behavioral Sciences 2013

Official Conference Proceedings 2013

Abstract

How can regulation in an era of personal responsibility aid people to make the optimal decisions about their future risks, savings, and retirement? This study aims to deepen our understanding of how different age groups process choices in relation to future risk and retirement planning in diverse decision-making environments. In a series of experiments, we examine how age and the life cycle interact with the decision-making environment concerning savings, retirement and well-being. Across multiple experiments we find that when cognitive resources are available older participants opt for more prudent financial and retirement choices, but that this pattern does not hold in situations that do not allow the luxury of executive control override. Moreover, in some instances, we find an increased effect of resource depletion for older compared to younger participants. At a theoretical level our findings suggest that much of the difference in financial choices between older and younger decision makers rests in the ability of each age group to override their intuitive and automatic responses to such decisions. At the policy level, as the regulatory field is moving from command-and-control rules to the provision of menu options and choice architecture, our findings provide potential guidelines for better designing retirement and savings plans, such as the implementation of SMT-style programs and the encouragement of annuity over lump sum retirement benefits.

Keywords: Decision making, Risk, Aging, Retirement, Executive Resources

I. Introduction

In the midst of an unsteady economy, many individuals approaching retirement age are discovering that their savings and safety nets are not nearly enough to see them through old age. As the menu of choices pertaining to prolonging quality of living and life spans continues to expand, individuals find themselves struggling with the planning of their future financial and general well-being. While these decisions are increasingly privatized, the decision-making environment is created by law and policy and is the subject of on-going public debate. In particular, policymakers now face the challenge of improving individual risk planning through choice architecture, information and design. The field of behavioural judgement and decision-making thus provides opportunities to better direct behaviour through policy design rather than through command-and-control. In particular, the novel experimental tool of cognitive depletion provides new ways to examine how the decision-making environment – the background conditions under which individuals make choices – affect different age groups in their future planning. It allows us to look beyond the existence of irrationalities, bounded rationality and biases, into the mechanisms and sources of decision-making processes. This article sets out to enrich the body of knowledge in the field to provide for better predictions of when and how people will choose to act for a more secure financial future. This article uses a behavioral lens of cognitive resources and executive controls to examine recent policy debates about pension reform.

In a series of experimental studies, we examined the effect of age on choices regarding future savings and enrollment, and selection between pension and medical insurance coverage options. Using new experimental techniques to manipulate executive control resources, we investigated the interactions between the various mechanisms that affect these decisions and the level of processing decisions: intuitive vs. controlled (or automatic vs. deliberative) evaluation. Our findings show significant differences between participants along age groups and important interactions between decision-making states, i.e. level of cognitive resources, and optimal future risk planning. In general, the findings reveal an increase in risk aversion in older age, contributing to an on-going debate in the literature about the effect of age on risk. More surprisingly, our findings reveal complex interactions between risk processing and cognitive states, which vary between types of decisions and age categories. Across these multiple experiments we find that when cognitive resources are available older participants opt for more prudent financial and retirement choices, but we also find that this pattern does not hold in situations when people are depleted, suggesting the variation along age lines in financial planning is often sourced in the ability of people to cognitively override (System 2) their initial automatic (System 1) decision-making processing. Moreover, in some instances, we find an increased effect of resource depletion for older participants compared to younger participants.

The article proceeds as following. Section II first introduces the present trend towards individual decision making in financial and future risk planning and the ways in which individual risk processing often fails to reach optimal results. Section III presents the design and method of the experimental studies along with the main findings in each of the experiments. Section IV provides a general discussion of the findings in relation to the behavioral field and relates the findings to contemporary policy implications, including the implementation of Save More Tomorrow (SMT)

style programs, the encouragement of annuity receipt in retirement plans, and the setting of decision-making environments that enable more prudent and rational financial planning. Section V concludes with an eye to the future of the research axes of cognitive resources and risk processing research.

II. The Rise of Individual Choice in Future Risk and Retirement Planning

In many countries, the future landscape of financial planning has been altered substantially in recent years by intertwining developments in legal regulations, economics, and technological advances. In general, the shift has been toward individual decision-making (Hacker, 2011). In the regulation of pensions, similar to the regulation of health and other aspects of individual well-being, the past few decades have signified a growing expectation that people are autonomous decision-makers. Moreover, individual decision-making has become a political ideal advocated across many continents and political ideologies (Amir and Lobel, 2012; Burgess, 2012). At the same time, the shift from regulatory command-and-control to a regime of consumer choice presents an acute need to understand how individuals process information and decide between menus of possibilities under varying background conditions, whether it occur in the realm of savings, pensions, health insurance or medical treatments. In the area of retirement planning and pensions this challenge is particularly pressing given the reality that contemporary choices are frequently suboptimal and prone to multiple judgement and decision-making failures.

In the regulation of retirement plans and pensions, the United States Congress initially passed the Employee Retirement Income Security Act (ERISA) in 1974 requiring employers to offer plan participants diversified investment choices, while also allowing participants to switch regularly from one option to another. Notably, the Congressional debates regarding the passage of ERISA expressed reservations about exactly how much freedom was available to employees (Lawrence, 2003). Congress anticipated that the Department of Labor would address the risk of too much choice through regulation. These expectations have yet to fully materialize in practice and there is ongoing controversy over the optimal policy design to encourage pension enrollment and saving (Bicksler and Chen, 2012; Rothman, 2001).

In general, the shift has continued to be toward increased individual choice. In the past three decades, defined contribution plans have gradually replaced defined benefits plans, the former becoming the more common form of retirement savings plan (Stabile 2007; Dulebohn, 2002; Choi, 2002). Under the traditional defined benefit form, an employer would typically guarantee a fixed amount of income upon retirement for its employees and financial professionals subject to certain fiduciary standards that would control the financial decisions for the investments (Stabile, 2002). Under defined contribution plans, employers do not guarantee the individual employee a fixed sum upon retirement. Employers are less involved with the retirement plan decisions, and the individual employee must take more control over investment decisions. In the 21st century, defined contribution plans are more practical and affordable for employers to offer employees than defined benefit plans. Increased employee mobility coupled with longer life expectancies makes transferability a practical component of savings plans for employees (Venhorst,

2006). Defined contribution plans are much easier for an employee to transfer from one employer to the next in the event of a job change (Lobel, 2006). At the same time, the shift marks a deepening of individual self-accountability, making “workers increasingly responsible for providing for their financial security in later life” (O’Neill, 2007; Dulebohn, 2002).

The trend toward individual responsibility presents a different set of challenges for employees. Most generally, people do not save at the needed level to maintain their standard of living during retirement. Recent data compiled by the Federal Reserve indicates that the median household headed by someone aged sixty to sixty-two has a 401(k) retirement savings account with merely one-fourth of the savings necessary to maintain their standard of living in retirement (Browning, 2011).

In reaction to the low levels of pension enrollment and contribution, Congress enacted the Pension Protection Act (PPA) with strong bipartisan support in 2006. The PPA is the most significant pension reform legislation in recent years since the passage of ERISA in 1974. One of the most important features of the PPA is the promotion of automatic enrollment as a default, and the escalation of contribution rates, again as an automatic default, increasing savings over time. The default contribution rate must be 3% or higher to begin with and escalate by 1% each year until reaching a rate of at least 6% and a maximum of 10%. The legal incentives under the Act to adopt this design are significant, including exemption from annual non-discrimination testing. The PPA further allows employees to get investment advice from interested parties. According to then Secretary of Labor Elaine Chao, this goal is intended to prevent employees from being “overwhelmed by investment choices or paperwork,” and to “boost retirement savings by establishing default investment for these workers that are appropriate for long term [retirement] savings.” (Chao, 2006). However, even though the PPA has made significant progress to promote employee knowledge about their own investments and the adoption of automatic enrollment and automatic increases in contribution, pension savings continue to be suboptimal. Policymakers and practitioners in the field of savings and retirement continue to search for a better regulatory design that will bring individuals to a healthy level of financial planning for future risk and aging, including optimizing tax incentives, encouraging automatic enrollment defaults and other program innovations that will increase participation and savings. A current popular proposal for reform that purportedly addresses the behavioral failures that prevail in savings is that of Save More Tomorrow Program (Benartzi and Thaler, 2004). The idea is to offer people a savings program that, rather than start immediately, will start with a certain delay and will increase as time passes.

The experiments in our studies aim to aid and advance these developing attempts to improve retirement planning by contributing to our understanding of the perils and promises of varying decision-making environments. Under the influence of policy and public opinion, decisions about future risk are frequently not singular decisions. As required by ERISA, for example, an individual could revisit his or her retirement plan several times a year. Similarly, one could theoretically periodically revisit their savings portfolio, their health insurance, or their medical regimen. At the same time, the behavioral field provides explanations as to why initial decisions exhibit inertia, carrying substantial weight and impacting the likelihood of future switch. Many individuals stick very closely to their first decisions, such as those decisions regarding contribution levels to their retirement savings (Goldstein et. Al, 2008; O’Neill, 2007;

Frolik, 2010). Indeed, automatic enrollment defaults have become a paradigmatic example of how shifting defaults dramatically shift participation levels (Madrian and Shea, 2001). Information overload may further contribute to the problem of decision inertia: when an individual feels overwhelmed by the vast amount of information to be considered to make a new decision, they may avoid the decision and prefer to stay with the status quo rather than make an additional difficult decision (Davis, 2006). Individuals can become struck by “analysis paralysis” when overwhelmed by numerous choices for a difficult decision, and can be intimidated by the selection process (O’Neill, 2007). As one article warns, “today’s consumers are surrounded by abundant financial information, which makes many decision-making situations difficult. This information overload creates stress, anxiety, and tension to process information, resulting in difficulties in memorizing and remembering, and poor decisions” (Kim and Kim, 2010). Procrastination also exacerbates the problem of inertia. With regard to pensions, many individuals repeatedly avoid confronting the difficult decisions of changing their retirement savings funds, and simply put off making new decisions for long periods of time. Termed in the literature as *passive decision-making*, in reality even individuals who intend to make changes to their initial decision often fail to follow through on their intentions. One study found that of respondents who reported that they planned to increase their retirement contribution rate in the next few months because they thought their present savings rate was too low, only 14% followed through on their intentions by actually increasing their contribution rate in the following four months (Choi et al., 2002). Thus, many factors contribute to the importance of the initial decision as they may prevent individuals from revisiting their initial investment decisions for their retirement.

These growing lessons of behavioral economics point to the significance of initial policy designs that help individuals of all ages make prudent choices for the future. Put simply, because individuals have increasing control over their retirement, but are prone to make mistakes in judgment and decision-making concerning future risk and prone to stick with whichever choice they made initially, understanding how the background decision-making environment affects individual choice is particularly acute. How an individual makes choices about future risk has much to do with how that particular individual perceives the risk. A person’s financial risk tolerance is the amount of risk they are willing to incur when investing and saving for retirement. The converse of risk tolerance is risk aversion. It is well established in the literature that the two have a strong negative correlation within the same person, so that when one increases the other decreases (Faff et al., 2008). At the same time, there is growing evidence that the same person can be more risk tolerant or more risk averse in different contexts, situations and cognitive states. All of us are constrained by time, information, beliefs, and computational power.

Recent studies have shown that beyond the difficulties of processing and understanding information related to risk, emotions similarly play a critical role in apprehension of personal and societal dangers, and in turn can lead to snap judgments in place of considered, reflective assessments (Kahan, 2008; Huang, 2008). From a policy perspective, the need to understand failures in risk processing is of equal gravity as the processes and mechanisms that contribute to these choices. If, for example, as lawmakers, we become convinced that the reason for suboptimal pension enrollment is that people are generally irrational in their inability to evaluate future risk based on behavioral evidence, the law should opt for a more top-down risk

regulation. If, on the other hand, better decision-making environments can override the mechanism that led to suboptimal choices, policy can help design the background ecology surrounding individual choices.

Importantly, developments similar to the shift toward greater autonomy and individual choice have clearly taken place in other areas, such as the related field of health planning. In the regulation of future medical risk, laws mandating disclosures regarding side effects and risk warnings assume that people want to make decisions themselves and want to do so by gathering and evaluating information about their choices. The widespread availability of choice in health insurance selection similarly points to the perils of unchecked privatized planning. Mimicking the developments in pension and retirement planning, evidence demonstrates that individuals are not consistently or adequately equipped to make optimal decisions regarding their health and wellbeing, despite the rise in individual autonomy and choice. In the aptly titled article, *The False Promise of Consumer Choice*, for example, Deborah Stone argues against consumer choice in the context of healthcare and health management. In all of these risk planning contexts, because choices have become more autonomous, law and policy must delve into the behavioral to determine how choices can be supported to prevent people from making poor future plans (Amir and Lobel, 2012; Amir and Lobel, 2008; Feldman and Lobel, 2010). Analysis of inter-generational differences in judgment and decision-making is ever more important because, on the most basic level, our lives and environments simply demand more decision-making. Planning for future risk, retirement and wellbeing requires individuals to make a wide variety of choices on whether to opt for certain financial safeguards, how to weigh costs against benefits and how to process information about risk and chose among available options.

III. Study Design and Central Findings

A. Method, Cognitive Depletion, and Executive Resources

The core of the study consisted of a series experimental lab studies where hypothetical cases were modelled on real problems and we manipulated the informational surroundings and background features in which the decision-making process took place. We asked individuals questions about their future risk management choices: We looked at decision-making in the context of savings, retirement, pension plans, financial investment, and insurance planning. In each of the experiments, we also added a dimension of resource depletion, a stage prior to the focal task, using a modified *Stroop Task*, as described below. The cognitive depletion manipulation was set to see whether performing unrelated tasks prior to the main decision-making one affects risk perception and subsequent decisions made (Pocheptsova et al., 2008; Feldman and Lobel, 2009; Amir and Levav, 2008; Amir and Ariely, 2007).

Choices about future risk are can be conceived as the result of the interplay of two systems: intuitive (System 1) and deliberative reasoning (System 2) (Amir and Lobel 2008; Frederick and Kahneman, 2002). Using cognitive depletion allows the observation of the interplay between the two systems. The underlying general hypothesis is that resource depletion has a systematic impact on choices, enhancing the role of intuitive System 1 by impairing the deliberate role of System 2 (Pocheptsova et al., 2008). Specifically, we examined the interplay of the two systems

when making future risky decisions by manipulating experimentally the availability of executive resources. A growing body of literature indicates that a seemingly unrelated activity that uses executive resources affects subsequent behavior (Muraven and Baumesiter, 2000). The literature shows that people's executive resources are limited and may become depleted by unrelated prior exertion. Further, when executive resources are depleted, the decision-making process is likely to rely more on intuitive processing. While the study of decision-making is an increasingly rich field, there remains uncertainty in the mental processes that leads to certain choices. Errors in decision-making arise from many sources and this study is designed to deepen our knowledge and offer novel insights of how such processes are relevant to retirement and future risk management. Relative to their importance, processing modes of risk have been understudied. In a series of recent and forthcoming studies, Amir and his collaborators test the nature of revealed preferences for, and aversion to, risk, arguing that these can be conceptualized as a temptation moderated by executive control processes. (Amir, et. al, 2012). Amir et al.'s findings demonstrate that resource depletion may lead to a preference for riskier options, and they hypothesize that risk aversion stems from similar mechanisms as self-control (or "self-regulation") and is subject to similar influences. While there are studies about connections between aging and risk, the interplay between age, risk-aversion and executive resources is still vague. Similarly, while there are many studies about the systemic ways people are affected by heuristics, such as choosing the middle option (compromise effects) or preference for inaction over action (status quo effects), there is still scarce study of whether such effects are mitigated or exacerbated by varying degrees of cognitive resources within different age groups.

B. Core Findings

i. Retirement Savings

a. Method

Participants

Participants were 838 individuals (ages 18-80, average age = 31, StdDev = 11.1, Median age = 27, 50% female) in Amazon.com's Mechanical Turk, paid \$1 in return for participating in our study.

Design & Procedure

The study had two conditions (Control vs. Depletion) in between subject design. Participants logged into the study and read instructions describing a reaction time task involving reading a name of a color printed in a font of a different color, and clicking the button describing the name of the color. In the control condition, participants had to click on the button designating the color written by the word (i.e., its semantic meaning) whereas in the depletion condition participants had to click on the button corresponding to the color of the font the word was written in. This setup represents a modified *Stroop Task* (Stroop, 1935; Pocheptsova et al., 2008), wherein the semantic interpretation of the word is primal and automatic, responding to the color the word is printed in requires cognitive override. The latter override process has been shown to deplete executive resources. Participants responded to 40 such screens, and then reached the dependant measures section that was identical between conditions. We also collected participants' demographic information, including age, at the end of the experiment.

Save More Tomorrow

Building on the design of the Save More Tomorrow experiment (Benartzi and Thaler, 2004), we asked participants to: “Suppose you were currently contributing 3% a year to the company's saving plan for your retirement. If you are like most of your fellow employees, you think you should be saving more but never seem to get around to it. You often think, well, next year I'll save more but right now my budget is just too tight. Suppose that a new plan was designed with you in mind. The plan is offering you the option of deciding now to commit some of your future salary raises. For example, if you join and receive a 5% raise, some of it would go towards your savings increase, say to 5% automatically. Your take home pay will still increase, but slightly less than it would have without the plan. You will be saving more and you will pay less in taxes since contributions to the saving plan are tax deductible. The same thing would happen again the following year. It is likely that if you join the program now, you may never notice the difference in your take home pay, but in a few years you would certainly notice the difference in the amount of money you had saved for retirement. Of course, if you change your mind, you could always withdraw from the program and reduce the level of contributions you are making to the plan.” We then asked participants about the likelihood of them joining such a plan on a 5-point scale ranging from “Not likely at all” to “Very likely.”

Lump Sum vs. Annuity

Participants were told that “Current retirement plans offer either a lump sum (i.e., you receive all the money you saved at once) or an annuity (i.e., you receive monthly payments over a long period of time. In the case of an annuity you continue to gain from accrued interest, so essentially you will get a larger total over the entire payment period.” They were then asked which of the two options they would rather have for their retirement.

Intertemporal Preferences

In a fairly standard measurement technique (Kim, B. et. al, 2012) participants read the following instructions: “Imagine that you are about to receive a tax rebate worth \$1,200. Imagine that you have the option of receiving the tax rebate today, or waiting 9 months to receive a larger rebate instead. Please indicate whether you'd prefer to receive the money today, or to wait 9 months and receive more money.” We then offered a choice between receiving the \$1200 rebate now or receiving a larger sum, incrementally growing with each choice frame, ranging from \$1250 up to \$2000 dispersed within the span of 9 months. All participants saw the \$1250 option, and only those participants who chose the immediate \$1200 were asked about increasingly larger postponed sums, such that we find the point in which a participant becomes patient, in the sense that he or she chooses the larger delayed tax rebate rather than the immediate sum. In this way we could calculate their discount factor.

b. Results

Tax Rebate

We will first analyze the time discounting results. As can be seen from the average linear effect in Table 1, the older a person is, the more willing they are to postpone rebate receipt, that is, they are willing to take a delayed rebate for a smaller dollar amount increment over the immediate sum. In other words, as people in the sample

grow older they become more patient with respect to money. However, the effect is actually curvilinear, as can be seen in the second model in Table 1, such that the younger and older people in our sample exhibit greater patience than the mid-group counterparts. An even closer observation of the differences between conditions, however, tells the complete story: we find a strong curvilinear effect when people are depleted, but no significant effect when they are not.

Table 1

	Linear effect	Curvilinear effect	Condition	
			Control	Depletion
Age	-1.9804 (2.06)	8.439726 (1.59)	-0.77617 (.1)	16.57786 (2.29)
Age ²		-0.13754 (1.99)	-0.02603 (.25)	-0.23505 (2.51)
Constant	439.5349 (13.87)	265.3545 (2.85)	432.325 (3.14)	118.206 (.94)

t-values in parentheses.

Savings decisions

In order to assess the effect of age on both savings decisions, the decision to gradually increase savings rates over time (STM) and the decision to take the pension fund as a lump sum or annuity, we contrast how younger and older people choose in our sample. As the age distribution is neither symmetric nor normal, we use a median-split (median age was 27) to comparing the younger and older halves of our sample. Table 2 displays the mean values for each decision in each age group.

Table 2

	Save More Tomorrow		% Choosing Annuity	
	Younger ^b	Older ^b	Younger	Older
Control ^c	4.11 ^d	4.3 ^d	82% ^a	78%
Depletion ^c	4.14	4.22	76% ^a	74%

^a Difference significant at $p = .1$

^b Controlling for individual heterogeneity in time discounting, older participants are more likely to opt in to the savings plan, $p = .045$.

^c Depleted participants across ages are more likely to choose lump sum over an annuity, $p = .08$.

^d Difference significant at $p = .04$.

As is evident in the table, we find a greater tendency to opt-in to a savings plan among older participants than younger participants. This effect does not apply if participants are depleted, as the older participants become less likely to opt-in than their non-depleted counterparts. The effect is large enough so that we still find an overall effect of the same nature.

We find no similar effects for the annuity decision. When it comes to the choice of an annuity or lump sum, we find that the younger participants are the most likely to choose the annuity, but that this incidence decreases when they are depleted, in line with an overall effect of a depletion-driven tendency towards the lump sum choice. A more basic result, but one that is worth paying attention to from a policy perspective,

is that in the frame of our experiment, where the choice between annuity and lump sum was not moderated by a default of one or the other, but where we told our participants that with annuity “you continue to gain from accrued interest, so essentially you will get a larger total over the entire payment period”, the majority of our participants across *all* conditions chose the annuity option.

c. Discussion

We can summarize our findings as two sets of effects and the interactions between them: effects of aging and effects of cognitive resources. Our current set of findings suggests that as people age they become more patient, that is, they are willing to wait for a tax return, as well as increase their savings rates at the cost of immediate consumption. At the same time, the closer people get to retirement, they are less willing to give up a lump sum and opt for receipt of their pension fund as an annuity. We also find that depletion of cognitive resources makes people overall have less patience, causing younger people to be more likely to go for the lump sum over the annuity. We also find that the effect on the willingness to hold 9 months for an increased tax rebate is curvilinear: when depleted, it is the middle-aged person who becomes impatient, but both young and old become more patient. It is possible that the younger participants are more sensitive to the monetary increment, while the older participants' consideration of the potentially shorter life expectancy is a controlled one. Our findings further raise the question of whether some ages and types of decisions are more susceptible to the effects of cognitive depletion. Such specific instances help shed light on the decision processes underlying these cases. We discuss these questions below.

ii. Future Investment and Insurance Choices

a. Method

Participants

Participants were 300 individuals (ages 18-68, average age = 34.4, StdDev = 11.93, Median age = 32, 53% female) in Amazon.com's Mechanical Turk, paid \$1 in return for participating in our study.

Design & Procedure

The study had two conditions (Control vs. Depletion) in a between subject design. Similar to the previous experiment, participants completed a modified *StroopTask* (Stroop 1935), either in the more depleting condition or in the less depleting one. They then proceeded to complete the two tasks described below. Task order was randomly assigned. Finally, we measured participant demographics, age being one of the items measured.

Investment risk

In this experiment, participants were offered a list of 10 investment choices in a sequential nature (fashioned after the Holt and Laury 2002, *Risk Preference Assessment Method*, Appendix I). Each investment decision offered two portfolios comprised of Stocks and Bonds. Participants were explained that “Stocks” meant high risk / high reward whereas “Bonds” meant low risk / low reward options. We measured the number of risky, as opposed to safe, options each participant made.

Choice of Coverage in Insurance Plans

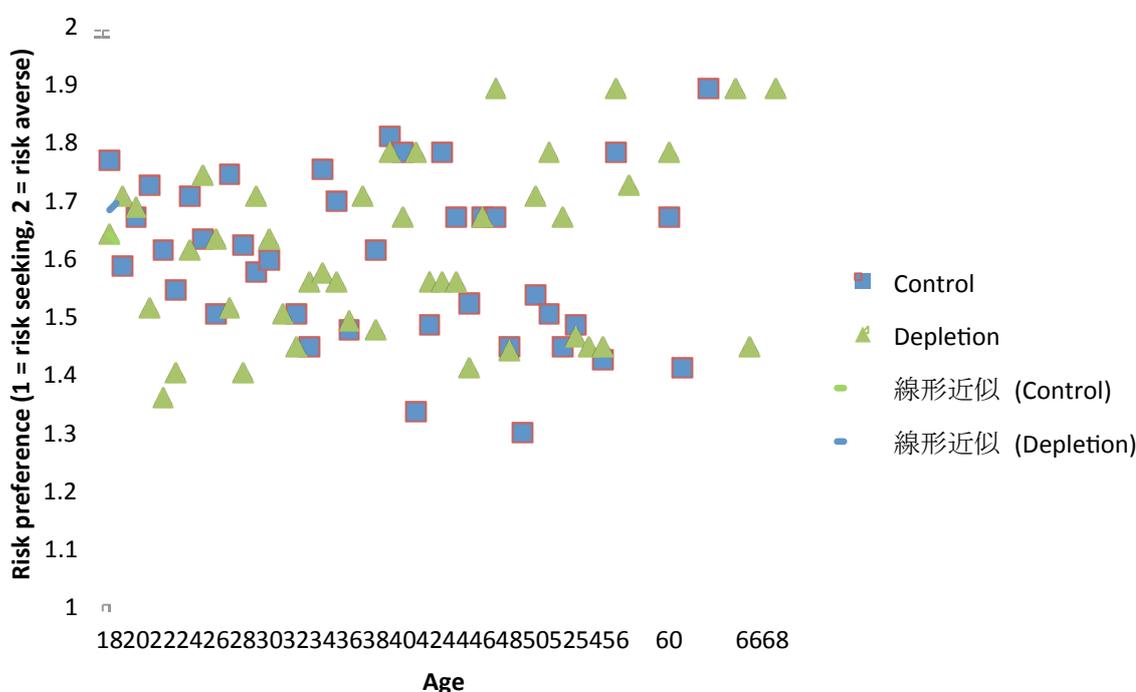
In this task, participants were faced with a choice of 3 possible health insurance plans differing in quality and price, ranging from the cheapest with the least coverage to the most expensive and comprehensive plan. This task is an example of a decision situation with an implicit, as opposed to an explicit, risk implication. Choosing the

cheaper plan implicitly means taking greater financial risk over the foreseeable future. Participants were asked to choose the plan that best suited their preferences and needs.

b. Results

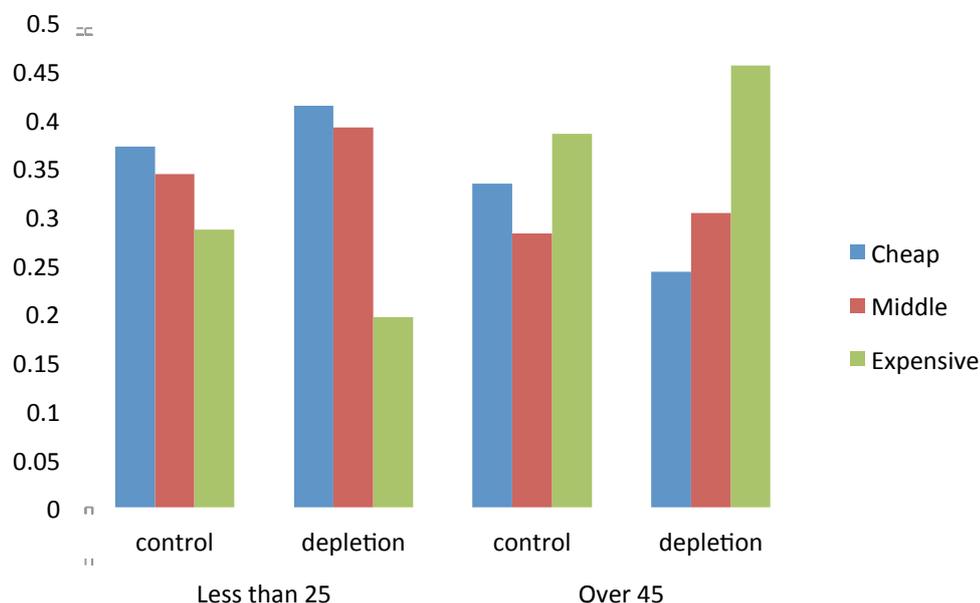
Participants' risk preferences can be measured as the proportion of stocks they chose (risky investment) over bonds (less risky investment). Regressing the number of risky choices on participants' age, the treatment effect, and their interaction yields the following results: we find a negative main effect for age ($\beta = -.008$, $t[296] = 2.03$, $p = .043$), that is, people become more risk averse with age; a marginally significant main effect for depletion ($\beta = -.163$, $t[296] = 1.81$, $p = .07$), and a marginally significant interaction ($\beta = .004$, $t[296] = 1.65$, $p = .1$). While participants' age was predictive of increasingly less risky preference in the control condition, the opposite was true when cognitive resources were scarce because of the prior unrelated depleting task (Figure 1).

Figure 1



With respect to insurance choice, we find that while younger participants seem to be somewhat more inclined to choose the cheaper plan (i.e., the more risky alternative) than their older counterparts (Figure 2), this effect is further exaggerated when the subject is depleted of cognitive resources ($t[162] = 2.33$, $p = .02$). That is, when cognitively depleted of, the younger audience will be much more likely to opt for the more risky insurance plan.

Figure 2



b. Discussion

Our experiment again leads to insights of three types: effects of aging, effects of cognitive depletion, and the potential interactions of these two effects. Consistent across both financial investments and the choice of insurance, we find that as people age they tend to take less risk and make safer choices. However, we also find that when depleted of cognitive resources, the opposite is true for financial decisions--it is the older participants who tend to take greater risk in their preferences for stocks over bonds. Conversely, with respect to health insurance plans, cognitive depletion yielded an increase in risk-taking for the younger participants, exacerbating their already inflated risk profile relative to their older counterparts.

IV. General Discussion and Policy Implications

The study aimed to shed light on preferences for risk and retirement savings as a function of both age and the processes underlying the preference dynamics. Above and beyond rational reasons for varying preferences across different ages, such as differences in the life length of an investment, predicted career cycles or the proximity to retirement, there may be psychological differences among age groups. In order to disentangle these different effects, we designed a set of studies that presented various retirement-related decisions involving to people of various age groups. In order to shed light on the underlying psychological mechanisms, we manipulated the degree of available cognitive resources to realistically mimic different decision conditions and states.

Overall, when cognitive resources are available, our findings show that older participants opt for more prudent savings choices. Although older people on average seem to choose the more rational options among available alternatives, in the sense of

planning and saving, this pattern may not hold in situations that do not allow the luxury of executive control override, such as when tired, sick, distracted, or even after making a series of arduous other choices. In some instances, we also find the depletion of cognitive resources has an increased influence over older participants compared to younger participant. It is possible that older people are more susceptible the effects of depletion.

There are also situations in which age itself impacts the degree of temptation inherent in the decision. A good example is our lump sum versus annuity choice upon retirement choice. Here, the lump sum becomes more attractive as one gets closer to retirement. Indeed, we find that younger participants were less impacted by the temptation of receiving all savings at once. This incidence can presumably be explained by the temporal distance between the subject and the receipt of funds, as evidenced by the effect of depletion on this decision: when younger participants were depleted their choice pattern resembled that of their older counter-parts. Conversely, when available cognitive resources were higher, the younger participants chose the annuity option *more* often than the older participants. This underscores that age by itself is not a clear-cut proxy for risk preferences. Rather, age interacts with both the context of choice and the circumstances of the decision-making process.

At a theoretical level our findings suggest that much of the difference in financial choices between older and younger decision-makers lies in the ability of the decision-makers to override their intuitive and automatic responses (System 1) to such decisions. In other words, making more prudent financial choices appears to be a learned skill that relies on executive resources (System 2) for its execution.

In the two sets of experiments, we observed age differences in judgment and decision-making pertaining to future savings and risk. The findings that younger people are more likely to exemplify risk-taking behaviors while older people are more risk averse supports other studies in the field although the study of the interactions between age and risk tolerance has proven a challenge in the social sciences¹ (Halek and Eisenhauer, 2001). The literature indicates that older investors tend to have different attitudes toward risk than younger age groups, and yet, many of the findings have been non-conclusive and even contradictory. At the turn of the century, it was widely believed to be true among financial planners that the older a person was the more risk averse (and less risk tolerant) they became. (Grable and Lytton, 1999; Gilliam et. al, 2010; Palsson, 1996; Bakshi and Chen, 1994). However, other studies have concluded that, after accounting for other variables, age either has little to no bearing on a person's risk tolerance (Hanna et. al, 2001), or that older generations may be even somewhat more risk tolerant than younger ones. (Wang and Hanna, 1997; Hanna et al, 2001). Our findings can help explain why previous research has mixed results when it comes to the effect of age on a person's financial risk tolerance.

The literature in general accepts a "life-cycle risk aversion" hypothesis that entails the idea that risk aversion increases with age because as people get older their number of future pay checks decreases and so does their ability to make up for potential losses,

¹ The variation of risk tolerance along demographic lines has proven difficult in the social sciences. Interestingly, for example, the literature on the effect gender is also divided. It has been found in numerous studies that women have a lower risk tolerance than men, while other studies question these characteristics. See e.g., Fairlie, and Holleran 2011.

while those who are younger have plenty of time to make up for potential losses before they retire. Our findings show that more than the passage of time is at work with risk preferences and the findings offer a more nuanced picture of how age interacts with different decision-making processes.

In general, the literature consistently indicates that people in all age groups have difficulty in accurately assessing their own risk tolerance and preferences (Feldman and Lobel, 2010; Grable et. al, 2009; Moreschi,2005). Therefore, given this inability to self-assess and the conflicting and inconclusive findings in the existing literature, context-specific experimental manipulations offer insight into the cognitive processes underlying these choices. This method has the advantage of isolating certain variations and investigating the issues with a specific focus on particular areas of risk. Our studies support the understanding that risk tolerance is not an absolute personality feature, but varies within subjects according to various factors (Stewart and Brown, 2006).

From a policy perspective, the laws should direct the adoption of defaults in retirement saving plans that most reflect the population's underlying preferences and goals of well-being. As regulators shift to setting defaults among private choices, providing information, incentives and education rather than requiring one standard plan, policymakers must pay more attention to their role in shaping the decision-making environments and processes that affect individual choice. Depletion manipulations mirror many real life situations where multi-tasking or attention-control is required. For example, filling out long retirement plan option forms or the presence of flashing banners on a computer screen that display financial information can be distracting and lead to the depletion of an individual's ability to focus and synthesize information later on. Individuals do not arrive at the decision-making table as a tabula rasa chooser, but instead arrive with varying levels of cognitive resources at any given time. Beyond the significance of understanding the mechanisms of decision-making and judgement by manipulating levels of depletion in an experimental study, policy also shapes the decision-making environment to allow for greater focus and a more consistent choice process.

Policy plays an especially important (and legitimate) role in guiding behaviour in the context of retirement, as studies have shown that when choosing retirement plan features, participants who have weak preferences often adopt the features of median participants rather than their own initial selections (Benartzi and Thaler, 2002). Importantly, behavioral tendencies of starting to invest at an early age and setting up automatic deposits significantly impact the level at which individuals will save in the next stages of the life cycle (Hira et. al, 2009). Similarly, research indicates that gaining experience in investment planning in other financial contexts increases the likelihood to enrol and manage personal retirement accounts (Hira et. al, 2009). The spill over and accumulative effects of learning make it all the more important for policy to encourage prudent future financial planning patterns from an early age. To wit, while the effects in the experiments appear relatively small, from a policy perspective even small percentages of increased savings accumulate to very significant improvements in social planning.

Our experiments point to several specific ways in which policymakers can encourage higher enrollment and savings in retirement plans. First, our findings indicate the

wisdom of SMT-style plans. Benartzi and Thaler (2004) envisioned the SMT as having four features. First, employees are approached about increasing contribution rates three months prior to a scheduled salary increase. Second, if they choose to join, their contribution increases upon the first paycheck of the salary raise. Third, contributions automatically increase at every salary raise until a maximum is reached. Fourth, the plan is set as an opt-out at any time system. Beyond bounded rationality, recent studies in the behavioral field point to “bounded self-control”. People hold correct views with regard to their lives, but they lack the discipline or willpower to execute the correct choice (Mullainathan and Thaler, 2001; Baumeister, 2002). Our findings support the intuition that SMT structure is specifically helpful in overcoming self-control issues, by allowing individuals to self-commit in advance and reducing the effects of discounting of future losses. Individuals feel less the loss of future contributions than their immediate allocations. Also, tying the increase of retirement plan payments with salary increases helps people with their mental accounting: the absolute sums of their paychecks will remain commensurate with the increase in their contributions.

Another context worth emphasizing is the interaction between decisions to enroll in savings plans and the level of savings. Since behavior is often influenced by default choices, such as automatic enrollment defaults, it may be the case that while more people participate in a pension plans, levels of savings may remain conservative. This happens when contribution rates offered as a default are lower than what those chosen by individuals who would have chosen to enroll anyway. (Choi et. al, 2001). Therefore, any policy that sets default savings must be sensitive to not only the increased numbers of enrollment, but also to the overall impact on absolute savings. Our findings show that cognitive resources not only affect on/off decisions regarding the act of enrollment, but additionally affect the level of savings and contributions.

Third, the question of annuities must receive larger attention in pension reform debates. The risk of outliving one's assets in retirement is increasingly high. While the question of increasing savings and pension enrollment has become widely recognized for its significant impact on retirement planning in the future, there has been less attention to questions of how savings and pensions will sustain their holders in later age. Often, policies measure their success by the increase in the number of participants in a certain plan, without much concern about whether the saved assets will be adequate to reach their goal of sustaining the well-being of the client throughout their retirement. In our study, we examine this side of decision-making as well. A way to ensure that retirement savings continue to sustain individuals as they age is through lifelong annuities (Mitchell and McCarthy, 2003). Recent studies find that retirees holding annuities are more satisfied with their retirement (Panis, 2003). And yet, in most countries only relatively small percentage of retirement savings is currently devoted to annuities (Moore and Muller, 2002). In fact, while in the past the default for defined benefit plans was usually a life annuity, the recent majority of defined benefit plans offer lump sum distribution. Indeed, under American law, defined benefit plans must offer an annuity option - a series of monthly payments guaranteed for life – while defined contribution plans are not, by law, required to offer participants the option of taking an annuity (Purcell, 2007). A recent study shows that a majority of company pension distributions occur in lump sum cash outs and not in lifetime annuity payments (McGill et. al, 2004). In 2010, the U.S. Departments of Labor (DOL) and Treasury issued a request for comments on whether the agencies

should issue regulations to promote the use of annuities for participants in employer-sponsored defined contribution (DC) plans and individual retirement accounts, as part of the agencies' effort to enhance retirement security by reducing the risk that workers will run out of funds during their retirement years. According to the recent report, the number of active participants in DB plans fell from about 27 million in 1975 to approximately 20 million in 2006, according to the DOL. By contrast, the number of active participants in DC plans increased from about 11 million in 1975 to 66 million in 2006 (Federal Register 2010). Other countries, with Switzerland being a notable example on this end of the spectrum, have far greater rates of annuities, often due to mandatory requirements to annuitize (Bütler & Teppa 2007). At the same time, policy must consider the possibility that high levels of annuities can have a moral hazard effect of reluctance to work at an older age (Bütler 2009).

These large country variances again can be at least partly explained by behavioral effects. Individuals tend to underestimate the risk of outliving their savings, and prefer immediate control and return of investment. Brown et al. (2008) posit that individuals over-evaluate lump sums because they use a narrow "investment frame" that focuses on risk and return rather than a "consumption frame" that considers the consequences for lifelong consumption. Moreover, recent studies investigate how annuitization decisions are affected by changes in the annuity's value (Bütler, Staubli & Zito 2010). Our findings show that with the right framing, most participants in our study in fact preferred annuity payments to lump sum. This suggests that framing and changing the way information is provided to consumers can make a significant difference in shifting decisions toward annuity products. In others words, choice architecture, with specific attention to cognitive load during the decision making process, may be as effective as the harsher forced choices of annuitization.

Moreover, the interaction of age and depletion in this context indicates a reversal of the assumed aging effect on risk tolerance. Our findings showed that younger participants in a replenished state were more likely to opt for annuity payments. Policymakers and employers aiming to help individuals overcome their own default preferences biases can set annuities as the default option, rather than lump sum payment upon retirement.

Finally, from an information and decision-making environment perspective, our findings underscore the need for a tailored approach to successfully address each of these issues. For example, policymakers may also take into account that different age groups rely on different authorities to inform their decision-making. There is some indication in the literature that later in life individuals rely more on published information for advice than on family and friend networks. Similarly, where aging and experience leads to better choices, policymakers can draw upon the changing risk preferences that are brought upon by aging and adopt in particular contexts by instituting "modified default options" requiring individuals to take action to review their risk decision-making every several years (Poterba, 2005). This type of regulation would force individuals to face the decisions that they may otherwise seek to avoid, as they grow older and move from one risk group to another. Most generally, our findings suggest that there may be great value in education programs, informational programs, and decision-making settings that are specifically tailored by age groups.

V. Toward an Eye to the Future

Correcting cognitive bias through regulation presents unique challenges and choices (Amir and Lobel, 2008; Amir and Lobel, 2012; Korobkin and Ulen, 2000). Yet, the insights offered in the fields of behavioural economics and experimental psychology in recent years suggest the need for policy to engage in such inquiries in order to better aid the goals and challenges of wellbeing, retirement, and aging. As decision-making becomes more individualized, we strive to understand how decision-making happens in particular contexts and with regard to particular demographics (Yablon, 2004; Eskridge and Ferejohn, 2002). In general, our studies suggest that people's risk preferences are not absolute but are to some degree relative to the range of available options, contexts, and the state of the decision-maker.

In light of the problems created by individual assessment of risk and estimation of future problems, and the current trends stressing nudges, consumer, patient and investor education, policies that aid individual decision-making are an important facet of governance. While some scholars have argued that education needs to be emphasized much more, others claim that education would actually have few positive effects because it would not address the cognitive biases that influence investment decisions. Our study shows that moving beyond education, choice architecture designed based on insights provided by behavioral studies can become a focal point for policymakers. As such, we can begin to view laws as providing the context and direction for individuals striving to direct their own lives (Huang, 2008). Moreover, any attempt to impact individual behaviour through policy naturally requires a discussion about its legitimacy from a democratic and governance perspective (Amir and Lobel, 2012; Klick and Mitchell, 2006). In the context of retirement planning and pensions, the malleability of risk preferences gives more legitimacy to the role of the policymaker to positively impact people's choices in ways that contribute to their long-term well-being. Changes in the makeup of the economy and the population have created new challenges for future retirees. Regulations that are more in sync with how individuals of different ages process risk can be shaped to adapt to the new landscape and provide an improved background to private decision-making.

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Appendix I

Preference Assessment Method - Lottery Choice Series (Holt and Laury 2002)

1/10 of \$2.00, 9/10 of \$1.60	or	1/10 of \$3.85, 9/10 of \$.10
2/10 of \$2.00, 8/10 of \$1.60	or	2/10 of \$3.85, 8/10 of \$.10
3/10 of \$2.00, 7/10 of \$1.60	or	3/10 of \$3.85, 7/10 of \$.10
4/10 of \$2.00, 6/10 of \$1.60	or	4/10 of \$3.85, 6/10 of \$.10
5/10 of \$2.00, 5/10 of \$1.60	or	5/10 of \$3.85, 5/10 of \$.10
6/10 of \$2.00, 4/10 of \$1.60	or	6/10 of \$3.85, 4/10 of \$.10
7/10 of \$2.00, 3/10 of \$1.60	or	7/10 of \$3.85, 3/10 of \$.10
8/10 of \$2.00, 2/10 of \$1.60	or	8/10 of \$3.85, 2/10 of \$.10
9/10 of \$2.00, 1/10 of \$1.60	or	9/10 of \$3.85, 1/10 of \$.10
10/10 of \$2.00, 0/10 of \$1.60	or	10/10 of \$3.85, 0/10 of \$.10

The logo for the International Association for Frontiers in Psychology (iafor) is centered on the page. It consists of the lowercase letters "iafor" in a light blue, sans-serif font. The text is enclosed within a large, faint, light blue circular outline that is partially obscured by a red, curved graphic element on the left side of the page.

