The link between financial confidence and financial outcomes among working-aged Canadians

Boris Palameta | Cam Nguyen | Taylor Shek-wai Hui | David Gyarmati

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Social Research and Demonstration Corporation
55 Murray Street, Suite 400
Ottawa, Ontario K1N 5M3
613-237-4311 | 1-866-896-7732
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Toronto Office
481 University Avenue, Suite 705
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Executive summary

In an environment where people are required to be increasingly responsible for their own personal financial management, working-aged Canadians face numerous challenges. They are at a stage of life where they need to not only manage their day-to-day finances but also plan for future life events, such as buying a first home or saving for retirement. With a multitude of financial products, services, and offers to consider, making the right decision is not always an easy task.

Financial literacy is defined as the knowledge, skills, and confidence a person needs in order to make responsible financial decisions. "Knowledge" refers to an understanding of personal and broader financial matters; "skills" refer to the ability to apply that financial knowledge in everyday life; and "confidence" means having the self-assurance to make important decisions. Findings show that many people lack the financial literacy to make sound financial decisions. This points to an urgent need to improve the delivery of financial literacy programs and enhance the financial well-being of Canadians. We define financial well-being as "a state of being wherein a person can fully meet current and ongoing financial obligations, can feel secure in their financial future, and is able to make choices that allow enjoyment of life" (CFPB, 2015).

Knowledge is certainly a critical aspect of the financial literacy equation. However, interventions may under-deliver when they target only financial knowledge and neglect to consider other factors in people's ability to apply knowledge appropriately in decision-making.

While knowledge is clearly important, emerging evidence from behavioural economics shows that an array of interconnected psychological factors frequently result in systematic errors in financial decision-making, in which people act contrary to their own knowledge and intentions. These kinds of self-defeating decisions may in turn reduce confidence in people's ability to manage their own finances.

In an effort to add to the existing literature and begin to more clearly understand these psychological underpinnings of financial behaviour, this study makes use of microdata from the 2014 Canadian Financial Capability Survey to examine the links between an objective measure of financial knowledge, a subjective measure of financial confidence, and a range of financial outcomes among working-aged (25-to 64-year-old) Canadians.

The results highlight the central importance of confidence in financial decision-making, behaviours, and outcomes of working-aged Canadians.

Key findings

- **Many Canadians have low scores in either an objective assessment of financial knowledge or a subjective assessment of financial confidence, or both.**

  This suggests that there are substantial gaps to be filled in financial confidence, as well as in financial knowledge. Besides youth, other groups at risk for low knowledge, low confidence or both include women, those without a partner, those living in low-income households and those with lower levels of educational attainment.

- **Financial confidence is a better predictor than financial knowledge when it comes to outcomes associated with day-to-day money and debt management.**

  In fact, those with high levels of knowledge are likely to experience relatively poor outcomes in areas such as meeting financial commitments, making bill payments, budgeting, and managing debt, if they also have low levels of confidence. Conversely, those who have relatively low levels of knowledge achieve good outcomes in these areas if they have high levels of confidence. Confidence may be an indicator of good day-to-day financial practices requiring simple self-control-based "rules of thumb" (e.g., don't spend more than I make; pay off debt before spending more) rather than complex information processing.

  The conceptual and empirical findings suggest that learning-by-doing may be the key in this behavioural domain, as people who are successful in handling their daily money matters may be effectively learning from their own experience. Identifying best practices from people with high confidence may be a way to inform the design of interventions.

- **Financial confidence is also important in understanding many planning and saving outcomes.**

  Those who are knowledgeable, but have low levels of confidence are likely to experience poor outcomes in areas such as investing, saving for major purchases (such as a new home), knowing how much they need for retirement, and saving adequate amounts for retirement.

- **However, high financial confidence does not appear to "shield" those with low knowledge from relatively poor planning and saving outcomes.**

  Unlike with day-to-day money and debt management, those with high confidence and low knowledge tend to have poor planning and saving outcomes. It may be that good planning and saving practices require more complex information processing (e.g., which savings vehicles to choose; within these savings vehicles, which products are most suitable to choose; when to consult a financial advisor), and that sound practice in this area may in some cases be undermined by overconfidence.

Implications

These key findings suggest several implications for research, policy and interventions.

- **Interventions designed to enhance Canadians' financial well-being can be informed by a better understanding of the psychological underpinnings of financial choices.**

  Generally, our findings confirm that psychological factors associated with confidence are critically important when it comes to financial decision-making. Indeed, this research reveals a complex relationship between self-perceived skills and financial knowledge that varies based on confidence levels and is indicative of underlying psychological factors influencing behaviour.

- **Effective program design requires a better understanding of cognitive biases and their prevalence among different groups of working-aged Canadians.**

  Low confidence despite high knowledge (i.e., under-confidence) may be an indicator of poor financial practices stemming from a susceptibility to various kinds of cognitive biases in decision-making. This paper has reviewed several such biases, a number of which are associated with low confidence. An especially important bias in this context is likely to be the present bias—i.e., acting contrary to one's intentions with regard to future costs and benefits because of a tendency, when it comes time to act, to give more weight to immediate costs and benefits. Other important departures from rational decision-making related to the present bias include inertia and procrastination, and a tendency to weigh losses higher than equivalent gains.

  Designing strategies to address these biases may in many cases require more than simple knowledge-based interventions. In particular, interventions need to account for the specific biases of those who lack confidence in managing their finances and the decision-making processes that underlie their low levels of confidence.

- **Interventions related to planning and savings need to address the potential negative effects of overconfidence on financial outcomes.**

  Poor planning and saving outcomes among those with high levels of confidence but low levels of knowledge (i.e., the overconfident) may stem from a series of related but distinct biases.

  In contrast, the poor financial choices and outcomes of the overconfident may relate to their failure to see the need for change or to recognize their need for advice, because of tendencies to distort information through the lens of prior beliefs, and thus to attribute poor outcomes to bad luck rather than their own decisions. In this context, confidence built through ongoing success in day-to-day money and debt management may actually undermine planning and saving, since practices developed in the context of managing current financial needs may be unrelated to the information-processing demands associated with planning future needs.

  Designing interventions to target the potentially detrimental effects of overconfidence on financial decision-making would also require more detailed and direct measures of investing and saving behaviour, and investigation into how the presentation and framing of new information may influence changes in behaviour.

- **Carefully designed studies in controlled laboratory settings would allow for *direct measurement* of these potentially important biases and provide important insights into their role in financial decision-making.**

  Though currently available data do not allow for rigorous measurement or investigation of different kinds of cognitive bias, controlled laboratory experiments have been used successfully to measure similar constructs. These kinds of measures, in conjunction with existing indicators from the Canadian Financial Capability Survey, would help identify the specific needs and biases in decision-making associated with low and high confidence, and assess the extent to which such biases impact financial choices and behaviour.

Summary

In general, this research highlights several ways in which confidence and knowledge may be linked with financial decision-making, and suggests that a one-size-fits-all approach to intervention is unlikely to reap dividends. Instead, interventions need to be informed by a better understanding of the mechanisms through which gaps in confidence and knowledge lead to poor outcomes, and tailored to the specific needs of those with different kinds of gaps.

This research is intended to contribute to the existing empirical literature on the links between financial confidence, knowledge and outcomes. It also aims to set the stage for more detailed investigation into the psychological underpinnings of financial decision-making and how such investigations could inform the design and delivery of effective financial training interventions.

Introduction

In today's complex financial environment, Canadians shoulder more responsibility for their personal financial management than ever before. Working-aged individuals in particular face numerous challenges, as they are at a stage of life where they need to not only efficiently handle their current money matters, but also adequately plan for future life events such as buying their first home or saving for retirement. The multitude of financial products and services available offers a lot of choices to help them achieve their financial goals. However, with more options to choose from, making the right decision may not always be an easy task.

Financial literacy, defined by the knowledge, skills and confidence a person needs in order to make responsible financial decisions, has therefore become an increasingly necessary life skill for Canadians; however, evidence from a recent financial capability survey suggests that many people may not have sufficient financial understanding to make sound financial decisions. Indeed, when the financial knowledge of adults aged 18 and over was objectively assessed in the 2014 Canadian Financial Capability Survey, the average score was only 65 out of 100. More than six out of 10 adults rated their knowledge as "fair" or "poor," indicating that they often struggle to understand key concepts relating to personal finance. In addition, more than half did not have a good idea of how much money they needed to save to maintain their desired standard of living in retirement (Financial Consumer Agency of Canada, 2014).

These findings point to an urgent need to improve the delivery of financial literacy programs and enhance the financial well-being of Canadians.[1] The Government of Canada is leading the development and implementation of the *National Strategy for Financial Literacy – Count me in, Canada* providing individuals and families with the necessary tools to make responsible financial decisions. Fulfilling the commitment to improve the overall financial well-being of Canadians, this strategy seeks to ensure that individuals become not only better informed but also more confident and competent in managing their personal financial matters.

This research project will contribute to these objectives by examining in detail the conceptual and empirical connections between financial knowledge, confidence, and outcomes, with the aim of identifying key gaps to inform the design of more effective financial education interventions. Due to their design or focus, interventions may sometimes fail to produce desired changes in behaviour. For example, a recent meta-analysis of 201 studies by Fernandes, Lynch Jr, and Netemeyer (2014) concluded that the effectiveness of financial literacy interventions in changing financial behaviour depends on the topics covered, the length of the intervention and the amount of time that has passed since the intervention.

The lack of success of some financial education interventions may often be explained by a misalignment between the original conceptually broad definition of financial literacy — which

[1] The Consumer Financial Protection Bureau defined financial well-being as "a state of being wherein a person can fully meet current and ongoing financial obligations, can feel secure in their financial future, and is able to make choices that allow enjoyment of life" (2015).

encompassed not only knowledge of concepts and products but also the ability to act appropriately based on that knowledge — and the narrow way the concept has most often been operationalized in the field to focus on knowledge alone.

This narrow focus likely stems from the commonly held assumption that people with sufficient levels of knowledge will, in line with standard economic theory, act rationally in their own self-interest — that is, smooth lifetime consumption by saving during the higher earning part of the life cycle in order to allow for similar levels of spending in the lower earning phase. When people fail to behave as expected, it is often assumed to be because of a lack of information or inability to comprehend existing information (Garcia, 2013). As a result, financial education interventions are often designed to transmit knowledge or enable better processing of information. For example, to address the low level of financial literacy within the American population, multiple training programs were implemented to target individuals' knowledge of financial products, knowledge of financial concepts, or numeracy skills related to financial decision-making (Hastings, Madrian, & Skimmyhorn, 2013).

In the design of these interventions, the ability to apply financial knowledge appropriately under real life conditions is often either ignored or assumed to automatically arise when knowledge increases (Hathaway & Khatiwada, 2008; Willis, 2009). Yet psychological factors frequently undermine information and knowledge, resulting in systematic "errors" in decision-making in which people act contrary not only to rationality but also to their own knowledge and intentions (Willis, 2008; Yoong, 2011).

Emerging evidence from a number of fields indicates that financial outcomes are shaped not only by knowledge, but also to an equal or even greater extent by an array of interconnected psychological traits linked with confidence, future orientation and self-control (Garcia, 2013; Fernandes, Lynch, & Netemeyer, 2014). In the terminology of behavioural economics, an array of systematic departures from rational decision-making are catalogued under the rubric of ***cognitive biases***. Evidence of i) the pervasiveness of such biases in the context of financial decisions and ii) the link between cognitive bias and other psychological factors such as confidence/self-efficacy again suggests the central importance of psychological/emotional — rather than analytic/logical — processes in determining financial outcomes. This implies that in order to change behaviour, interventions need to target not only financial knowledge, but also the underlying psychological mechanisms that translate knowledge into effective action.

In an effort to add to the existing literature and begin to more clearly understand the psychological underpinnings of financial behaviour, the first objective of this research project is to examine the determinants of a range of financial outcome measures from the 2014 Canadian Financial Capability Survey (CFCS). Although the CFCS does not directly capture indicators for cognitive bias, self-control, or future orientation, it does include measures for both objective financial knowledge and self-assessed financial ability (i.e., financial confidence/self-efficacy). This allows us to investigate the extent to which variability in financial outcomes is linked with financial confidence/self-efficacy independent of level of objective financial knowledge, and vice versa.

The second research objective is to look more closely at the interaction between knowledge and confidence, and examine how discrepancies between them are tied to financial outcomes. Evidence

suggests that because low confidence may be linked with susceptibility to cognitive bias, it may be a driver of poor outcomes even if level of knowledge is high. Similarly, if those with high levels of confidence are less prone to certain kinds of cognitive bias, they may do well even if their level of knowledge is below average. On the other hand, confidence may not be an effective buffer against lack of knowledge in financial domains where information complexity and processing demands are higher.

Investigating the independent and joint effects of confidence and knowledge on financial outcomes will allow us to begin to explore the practical implications with respect to the effective design and targeting of financial education interventions, supporting the Government's commitment to raising the financial literacy of Canadians.

Research questions

In light of these objectives, data from the 2014 CFCS will be used to address the following research questions:

1) When indicators of ***financial confidence*** and ***financial knowledge***[2] are examined ***independently***, to what extent is each linked with financial behaviour and well-being among working-aged adults, including: a) day-to-day expense and debt management, b) planning and saving, for either retirement or other purposes?

2) When indicators of ***financial confidence*** and ***financial knowledge*** are examined ***jointly***, to what extent are they ***discrepant*** (e.g., high confidence/low knowledge; low confidence/high knowledge), and what respondent characteristics are associated with these discrepancies?

3) How are discrepancies between ***financial confidence*** and ***financial knowledge*** linked with financial behaviour and well-being among working-aged adults? For example, do high levels of confidence lead to positive outcomes, even if knowledge is low? Are high levels of knowledge undermined by low confidence?

Answering these questions will provide a substantial contribution to the existing empirical literature on the links between financial confidence, knowledge, and outcomes, as well as setting the stage for further more detailed investigation of the psychological underpinnings of financial decision-making and how such investigations could inform the design and delivery of effective financial training interventions.

[2] These terms are defined and operationalized on pages 13-15.

Box 1 Key findings

The first major finding from this project highlights the ***importance of financial confidence as a determinant of day-to-day expense and debt management***. In fact, variability in indicators of expense and debt management is usually more likely to be linked with confidence than with financial knowledge.

The importance of confidence in the realm of expense and debt management is further highlighted by outcomes associated with confidence/knowledge discrepancies. For example, those with high levels of knowledge are likely to nonetheless experience relatively poor outcomes in this domain if they also have lower than average confidence. Similarly, those with below average knowledge nonetheless tend on average to experience relatively good outcomes if they also have high levels of confidence.

This suggests that low confidence may be an indicator of awareness of poor financial practices in the area of expense and debt management, and that psychological factors such as lack of self-control, present bias and future discounting may combine to undermine behaviour even when the person in theory "knows better". In contrast, high confidence may be an indicator of good day-to-day financial practice in a domain that may require simple self-control based "rules of thumb" (e.g., don't spend more than I make; pay off debt before spending more) rather than complex information processing in order to do well.

The second major finding indicates that both ***financial confidence*** and ***financial knowledge*** are linked with financially desirable behaviour and positive outcomes in the area of planning and saving. Variability in indicators of planning and saving is as likely to be linked with confidence as it is with financial knowledge.

In terms of confidence/knowledge discrepancies, as was the case with expense and debt management, those with low levels of confidence are likely to experience poor planning and saving outcomes even if they also have high levels of knowledge. However, unlike with expense and debt management, high confidence does not appear to "shield" those with low knowledge from relatively poor planning and saving outcomes. It may be that good planning and saving practices require more complex information processing (e.g., which savings vehicles to choose; within each vehicle, which products are most suitable; when to consult a financial advisor), and that sound practice in this area may in some cases be undermined by overconfidence.

Generally, results from the current research confirm that psychological factors associated with self-confidence and self-efficacy are critically important — sometimes more important than knowledge of financial principles — when it comes to financial decision-making. Therefore, interventions designed to enhance Canadians' financial literacy need to be informed to a greater extent than they have been by a thorough investigation of the psychological underpinnings of poor financial choices — including possible links with self-control and different types of cognitive bias.

These findings and their associated implications are discussed in more detail below. The rest of the report is organized to highlight these major findings from the analysis. Results of the literature review, including descriptions of important cognitive biases known to be associated with financial decision-making, and a brief review of the evidence linking these biases with both confidence/self-efficacy and poor financial outcomes, are discussed in the next section. This is followed by a brief description of the dataset and measures of financial confidence and knowledge, the methodology and results of the descriptive analysis, and finally a detailed presentation of the methodology and results of the multivariate analysis. The report concludes with a discussion of the implications for policy and future research.

Literature review

Enhancing the financial literacy of Canadians contributes to the financial well-being of households, as well as to the stability of the economy at large. According to the Bank of Canada, household finances are an important factor in the vulnerability of the financial system (Cateau, Roberts, & Zhou, 2015). Over the past decade, the stability of the economy has been substantially influenced by increasing household debt-to-income ratios. Specifically, as documented by Statistics Canada, the aggregate ratio of household debt to disposable income in 2013 was 1.63 (i.e., $1.63 of debt for every dollar of disposable income), much higher compared than the ratio of 0.89 recorded in 1990 (Uppal & LaRochelle-Côté, 2015). Furthermore, the proportion of highly indebted households with debt-to-income ratios exceeding 350 per cent have doubled since 2008, exacerbating the vulnerability of the financial system to macroeconomic shocks (Cateau, Roberts, & Zhou, 2015).

The need to enhance the financial literacy of Canadians has been recognized for at least two decades. Originally, financial literacy was broadly defined in terms of having the ability to manage personal finances effectively. The concept was first defined in 1997 by the Jump$tart Coalition for Personal Finance Literacy as "the ability to use knowledge and skills to manage one's financial resources effectively for lifetime financial security". This definition — also adopted by the President's Advisory Council on Financial Literacy in 2009 — implies that financial literacy encompasses not only knowledge of concepts but also the ability to act appropriately based on that knowledge.

However, despite this broad initial conceptualization, financial literacy — and education programs designed to enhance financial literacy — have since tended to be more narrowly operationalized in terms of measuring and targeting objective knowledge of financial concepts and/or products. However, the research literature shows that the effectiveness of knowledge-based interventions in changing behaviour is mixed at best (Hathaway & Khatiwada, 2008; Willis, 2009; Fernandes, Lynch, & Netemeyer, 2014). For example, in one study those whose factual knowledge had been successfully increased after education interventions did not increase their ability to make desirable financial decisions in real life (Willis, 2009).

Furthermore, a parallel line of evidence shows that financial behaviour is shaped not only by knowledge, but also to an equal or even greater extent by an array of interconnected psychological traits such as self-efficacy and self-control. Though psychological traits are rarely measured in a financial literacy context, when they are, they explain variability in financial outcomes as much or more than objective measures of knowledge (Fernandes, Lynch, & Netemeyer, 2014). In addition, a large and growing behavioural economics literature documents numerous links between suboptimal financial outcomes and individual tendencies to deviate from rational, information-based decision-making when it comes to financial matters. The propensity to adopt narrow viewpoints that ignore other pertinent information and lead to systematic errors in decision-making is called ***cognitive bias***. We focus on two important biases that have been repeatedly linked with financial decision errors and from which a set of other biases appear to stem — namely i) the tendency to display present-oriented actions despite having future-oriented intentions (***present***

bias), and ii) the tendency to overestimate one's own ability even in the face of evidence to the contrary (***overconfidence***).

Cognitive bias in financial decision-making

Recent studies of personal finance stress the importance of cognitive bias in daily financial decision-making (Willis, 2008; Yoong, 2011; Garcia, 2013). Financial decision-making requires recognizing and responding to trade-offs between near and long-term costs and benefits, under conditions of ambiguity and uncertainty (Willis, 2008). The presence of multiple sources of information and varying timelines are all potential triggers for cognitive bias (Willis, 2008).

Bias in borrowing and saving

Over-borrowing and under-saving may frequently stem from ***present bias***, i.e., when immediate consequences of an action are given greater weight than future consequences, resulting in behaviour that is often contrary to the actor's intentions. For example, spending beyond one's means may occur if the immediate benefits are given greater weight than the delayed costs (debt-related interest payments). Similarly, saving decisions are associated with bearing immediate costs in terms of foregone consumption in order to realize delayed benefits — if the benefits are discounted, spending rather than saving may result.

Present bias may frequently be an expression of lack of self-control — for example, when asked about long-term goals, stating a preference for larger delayed rewards, but for present-day decisions choosing smaller immediate rewards instead (Kosse & Pfeiffer, 2013). Susceptibility to present bias has been empirically linked with poor financial outcomes. For example, those who exhibited present bias in financial decisions measured in a controlled laboratory setting were more likely to subsequently accumulate higher levels of credit card debt and save a lower proportion of their tax refunds (Benton, Meier, & Sprenger, 2007). Interestingly, individuals who were more likely to exhibit present bias in the lab did not differ in their intended savings from those who showed less present bias, but when it came time to translate intention into action the former group ended up saving significantly less than the latter.

Present bias and self-control issues are also postulated to be the leading cause of procrastination in retirement planning and saving — activities that involve immediate costs in planning time and effort, and distant benefits (Yoong, 2011). Brown and Previtero (2014) used administrative data to establish a direct link between procrastination and an array of retirement planning behaviour. Procrastinators — defined as those who waited until the last possible day of their compulsory health care enrolment period to make a plan selection — were less likely than non-procrastinators to participate in a voluntary savings plan, with those who did participate taking longer to enrol and contributing smaller amounts. The authors provide evidence that the pattern of behaviour exhibited by procrastinators could be best explained as the outcome of present bias rather than alternatives such as optimal delay or rational inattention (Brown & Previtero, 2014).

Similar self-control problems are postulated to be the reason why less sophisticated financial consumers keep accumulating credit card debt even when they intend to pay it off (Kuchler, 2013), why a significant proportion of households maintain high levels of credit card debt even when they

possess substantial, low-interest liquid assets (Bertaut, Haliassos, & Reiter, 2009), why people take out expensive payday loans (seen as an immediate benefit) even when they are fully informed of the associated (time-delayed and therefore discounted) costs (Bertrand & Morse, 2011), and why people go over budget even when they intend not to, because they underestimate the cost and frequency of extravagant purchases for special occasions (Thaler, 1990).

The prevalence in many consumer-industry contracts of features designed to exploit present bias, such as back-loaded fees, automatic renewal, and cancellation fees, provide indirect evidence for the susceptibility to present bias among a significant portion of the consumer population (DellaVigna & Malmendier, 2004). A study that offered financial vehicles designed to counteract self-control issues by restricting access to savings until certain threshold amounts or dates were reached found that these vehicles were most likely to be taken up by those who showed a lab-measured tendency toward present bias, suggesting that at least some potential savers were aware of their bias and welcomed assistance in counteracting it (Ashraf, Karlan, & Yin, 2006).

Bias in choosing financial products

Cognitive bias also plays an important role in the realm of choosing financial products. For example, once a choice is made, people tend to follow the path of least resistance and stick with it — a concept known as ***status quo bias*** or inertia. This may lead to systematic decision errors and suboptimal behaviour; for example, a reluctance to switch credit card contracts even when a more cost-efficient one is offered (Agarwal, Driscoll, Gabaix, & Laibson, 2009), failure to take advantage of mortgage interest rate changes in a timely manner (Campbell & Cocco, 2015), or failure to alter the pension contribution allocations or rebalance retirement portfolios (Madrian & Shea, 2000; Thaler & Benartzi, 2004; Beshears, Choi, Laibson, & Madrian, 2009).

Status quo bias may be particularly problematic when there are many options to choose from. People tend to choose to do nothing when offered multiple options even when inaction is not their preference when offered fewer options. For example, when employers offer multiple retirement savings funds, employee participation rates tend to be lower than when fewer options are offered (Iyengar, Jiang, & Huberman, 2003). Similarly, consumers are more likely to borrow when a loan lender advertises a single loan choice rather than a variety of loan sizes and term lengths (Bertrand, Karlin, Mullainathan, Shafir, & Zinman, 2005), and are likely to consider only a single insurance company for all their policies though shopping around would be beneficial (Willis, 2009).

Making decisions around financial products may also be hampered by people's tendency to weigh losses higher than gains of equal size. This kind of loss aversion, coupled with a common phenomenon called mental accounting — where people tend to see small groups of transactions or even individual transactions as isolated and not connected with each other — combine to produce ***myopic loss aversion*** (Hopfenitz & Wranik, 2008). Under myopic loss aversion, people behave as though financial choices are like a number of small lotteries each with its own individual chance of win or loss, rather than looking at the overall outcome. Seeking to minimize the frequency of losses may lead them to avoid volatile investments with high average returns in favour of more stable products that have lower return. Loss aversion may also play a role in status quo bias around investment choice, as people may protect themselves from the risk of a possible short-term loss by

sticking with their original choice, even if realigning their portfolio is likely to lead to long-term gain.

Experimental evidence of myopic loss aversion has been found repeatedly, with different subpopulations including professional traders. People tend to invest higher amounts when the volatility that can occur in any given round of trading is made less salient by pooling and presenting information from several rounds in aggregate — in other words when information is framed to minimize the chance of activating myopic loss aversion (e.g., Gneezy & Potters, 1997; Haigh & List, 2005).

Not surprisingly, both status quo bias and myopic loss aversion are related conceptually and empirically to present bias. Status quo bias/inertia is basically another type of procrastination, whether it occurs in the context of forgoing a savings opportunity or forgoing an opportunity to reallocate existing savings to obtain a higher return. In either case, the individual fails to take action and thus incurs an immediate cost, even though long-term benefits are likely to be substantial. Brown and Previtero (2014) showed that those who are most likely to exhibit present bias were also the most likely to succumb to inertia and fail to make changes to their default investment allocation when they participated in an employee savings plan.

Similar to present bias, myopic loss aversion is characterized by a short-sighted failure to see beyond immediate costs — for example, overweighting short-term investment losses when making investment decisions. Van der Heijden, Klein, Muller, and Potters (2012) showed a direct empirical link between present bias and myopic loss aversion. They found that when people made investment decisions in the lab, those with a greater susceptibility to present bias were also most affected by the framing of the investment decision. The decision was presented under two possible conditions, the first designed to elicit myopic loss aversion by giving feedback on returns after every round of investing (high volatility, occasional heavy losses) and the second designed to mitigate loss aversion by giving feedback less frequently and in aggregate (less volatility, big losses cancelled out by big gains). Both conditions had the same average return, yet those with present bias invested higher amounts when feedback on returns was presented less frequently and in aggregate rather than for each individual round of trading — suggesting that they were influenced by myopic loss aversion. In contrast, those who were less affected by present bias invested similar amounts regardless of how feedback on returns was presented (van der Heijden, Klein, Muller, & Potters, 2012).

In addition to biases that lead to inaction in decision-making, people may also make systematic errors as a result of taking too much action, stemming from ***overconfidence*** and related biases. Overconfidence is the tendency to be more confident in one's abilities or judgment than is measurably justified. Overconfident investors overestimate the quality of self-collected information, beliefs, and actions, while underestimating contrary information from other sources. Overconfidence is the common factor in a host of other biases, including a tendency to place greater weight on information that confirms one's own beliefs (confirmation bias), interpret past events through the distorting lens of one's beliefs (hindsight bias), or attribute positive events to one's own actions and negative ones to external forces (self-serving bias).

Overconfident investors are less likely to rely on information from other sources and therefore more likely to suffer poor returns, often from under-diversification (Fellner, Güth, & Maciejovsky, 2004; Guiso & Japelli, 2006; Kramer, 2012; von Gaudecker, 2015).

Overall, a growing body of research suggests that cognitive bias systematically undermines people's financial behaviour and decision-making, even when they are aware that their actions run contrary to their preferences or are objectively suboptimal. In the next section, we explore individual differences in susceptibility to cognitive bias within a self-efficacy framework in order to understand how different cognitive biases may be linked with self-efficacy/confidence by limiting individual capabilities to act on discrepancies between financial goals and actions.

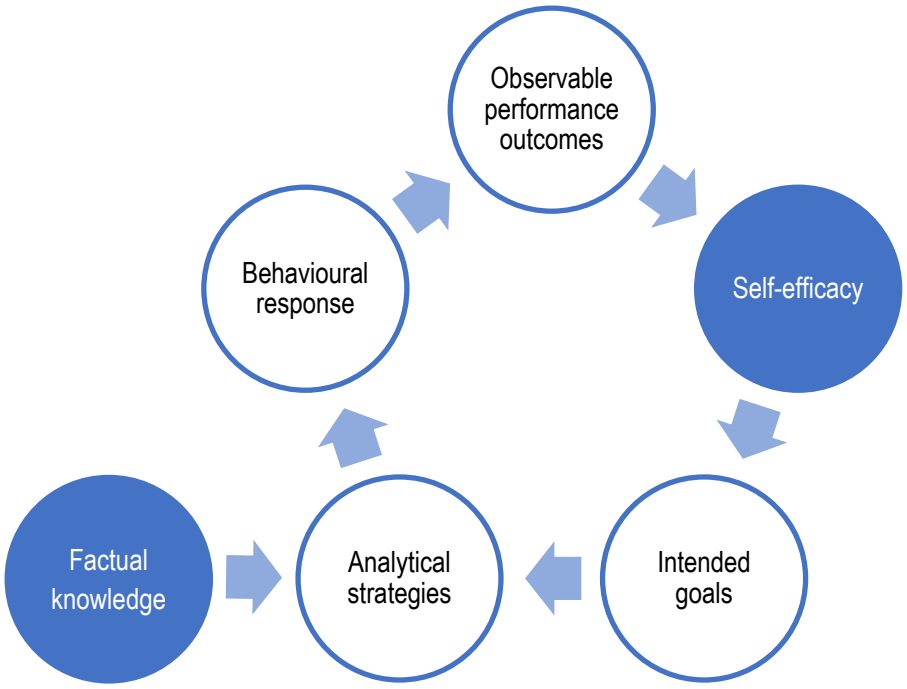
Linking cognitive bias with self-confidence

Bandura's (1977; 1993) social cognitive theory provides a useful starting point for understanding the connection between cognitive bias and self-confidence. Taking into account the interaction between factual knowledge and subjective self-understanding on human functioning, Bandura (1977) constructed the social cognitive theory to summarize the causal mechanism through which past performance influences patterns of present behaviour. This theory explains that effective intellectual functioning requires much more than the simple understanding of factual knowledge, as self-reflection also plays an important role (Bandura, 1993). In particular, the results of past performance can shape self-efficacy: a sequence of successes tends to enhance self-confidence while a series of failures can undermine it.

Together with judgment of past performance, self-efficacy informs personal goal-setting (Bandura, 1993). People with higher self-efficacy set goals that are more challenging and make firmer plans to commit to their goals, because they believe they are capable of achieving such goals. As a result, they are more likely to outperform those with lower self-efficacy, given the same level of skills and knowledge.

Depending on their intended goals, people choose different analytical strategies, incorporating factual knowledge in different ways when they make a behavioural response (Bandura, 1993). Whether or not their analytical strategies are effective can then be observed through the results of their subsequent performance. This is a perpetual cycle through which people learn from their experience, build their self-efficacy, set their intended goals, incorporate factual knowledge to define their analytical strategies, and determine their behavioural outcomes. Figure 1 is a diagrammatic summary of this process.

Figure 1 The perpetual cycle of self-efficacy, intended goals, and observable performance



Source: Adapted from Bandura (1993).

The cycle continuously evaluates the discrepancy between goals and performance, and updates performance results to re-evaluate the perception of self-efficacy. This then leads to new intended goals, and so on. In this framework, self-efficacy is a core indicator that acts to reduce the discrepancy between goals and performance. Factual knowledge is seen as a factor outside of this cycle, but plays an important role in shaping the analytical strategies, which in turn determines the behavioural response as well as the observed outcomes.

Putting self-efficacy in the context of financial behaviour

As reviewed in the previous section, cognitive bias can produce systematic decision-making errors that undermine financial intentions and performance. Failures of self-control mean that these errors may persist even when individuals have full access to the information needed to avoid them. In the context of the perpetual cycle above, cognitive bias may negate the effect of objective knowledge and lead to discrepancies between *intended* financial goals and *observed* performance outcomes. Repeated failure to achieve performance outcomes that meet one's intended goals, as well as inability to incorporate knowledge successfully into the kinds of analytical strategies needed to avoid this failure, would consequently weaken self-efficacy.

In comparison, those who are less prone to systematic errors in decision-making are likely to make better use of factual knowledge and develop effective analytical strategies to allow them to act closer to their intentions, resulting in smaller and more easily resolved discrepancies between goals

and performance and thus higher self-efficacy. Therefore, one can predict that all else being equal those who are more prone to cognitive biases such as time-inconsistent preferences, myopic loss aversion and status quo bias would tend to have lower self-efficacy.

The research literature generally supports this prediction. For example, procrastination is not only linked with present bias and poor financial outcomes, but also with low self-efficacy (Steel, 2007; Brown & Previtero, 2014; Rozental & Carlbring, 2014). Similarly, participants with low levels of self-efficacy were more likely to make decisions characterized by myopic loss aversion when they selected investment products under different feedback frequency conditions (Hopfensitz & Wranik, 2008). In addition, people with low self-efficacy are less likely to seek information and make an informed choice on plan switching, and are instead more likely to be influenced by inertia and simply stick with their default plan (Han, 2014).

In summary, those with low self-efficacy are on average more likely to be prone to present bias, inertia, and myopic loss aversion, and thus more likely to experience poor financial outcomes, even if they have financial knowledge. In contrast, the model would predict that when coupled with sufficient financial knowledge, people who are confident in their own financial capability are likely to behave in a financially desirable way, effectively managing their current money matters as well as their future financial plans.

However, the correlation between self-efficacy and financial outcomes is only moderate, suggesting that in some cases those with high self-efficacy may make poor financial decisions. Indeed, though high financial confidence may signal good day-to-day financial practice, the research literature suggests that poor outcomes may result when high confidence is undermined by low knowledge in areas that require relatively sophisticated decision-making such as investment and saving. When high confidence is combined with low levels of knowledge, decision-making may be based on overconfidence rather than true skill. Furthermore, those who are overconfident may be subject to a variety of biases such as tendencies to attribute positive events to one's own actions and negative ones to external forces (*self-serving bias*), to rely selectively on information that confirms one's own beliefs (*confirmation bias*), and to interpret past events through the distorting lens of one's beliefs (*hindsight bias*). These biases may allow the overconfident to maintain high levels of self-efficacy and refrain from seeking advice or help even in the face of poor financial outcomes.

Empirically, it has been found that investors with high levels of self-perceived financial ability but low levels of objective knowledge are less likely to rely on information from other sources and therefore more likely to suffer poor returns, often from under-diversification (Fellner, Güth, & Maciejovsky, 2004; Guiso & Japelli, 2006; Kramer, 2012; von Gaudecker, 2015).

Based on the preceding discussion of the links between different kinds of cognitive bias and self-efficacy, we can generate a series of general hypotheses on how cognitive bias and self-efficacy may interact with financial literacy to produce financial outcomes.

- Low confidence in one's own ability to perform financial tasks (i.e., low financial confidence) may be a product of either: a) low levels of knowledge, or b) low levels of self-control, and thus chronic misalignment between goals and performance, among those with high levels of knowledge. In either case, we expect to see generally poor financial outcomes.

- High levels of confidence in one's financial capability should be linked with good outcomes, especially for those who also have high levels of financial knowledge.
- Those with high levels of financial confidence but low levels of knowledge may experience relatively poor outcomes in financial domains that require relatively complex and sophisticated information processing, such as investment, product choice, and retirement planning.

The next sections present the data source as well as the measures and methodologies used to analyze and test these hypotheses on an empirical level.

Data source and measures

Statistics Canada's 2014 Canadian Financial Capability Survey (CFCS) contains the most up-to-date information on Canadians' financial knowledge, confidence, outcomes, and behaviour. The survey includes both an *Objective personal assessment* module to capture each respondent's actual knowledge in a variety of financial domains, as well as a *Subjective personal assessment* module that captures respondent confidence in their own ability to perform various financial actions. These measures serve as the independent variables or predictors of financial outcomes for our study.

In addition, the CFCS collects data on a range of financial outcomes and behaviour, including day-to-day money management and budgeting, expenses and debt, planning, saving, and preparation for retirement, as well as choice of financial products and use of financial advice. The information collected from these questions is used to construct indicators capturing behaviour in 1) money and debt management, 2) general planning and savings, as well as 3) retirement planning and savings. These behavioural indicators serve as the dependent variables and outcomes of interest for our study. The detailed derivation of these variables is discussed in Appendix A.

Unless otherwise noted, our analyses utilizes the population-weighted sample of those aged 25 to 64. We use descriptive and multivariate analysis to address our research questions. In the descriptive analysis, we describe the extent to which the two independent variables are discrepant (i.e., how common are high confidence/low knowledge, and low confidence/high knowledge?), and document respondent characteristics that are associated with confidence/knowledge discrepancies (for example, which kinds of respondents are likely to have high levels of confidence, and which kinds are likely to have low levels, at a given level of level of knowledge?). The multivariate analysis allows us to examine to what extent financial confidence and financial knowledge are linked, both independently and jointly, with each of the key outcome indicators identified in Appendix A.

Indicator of objective financial knowledge

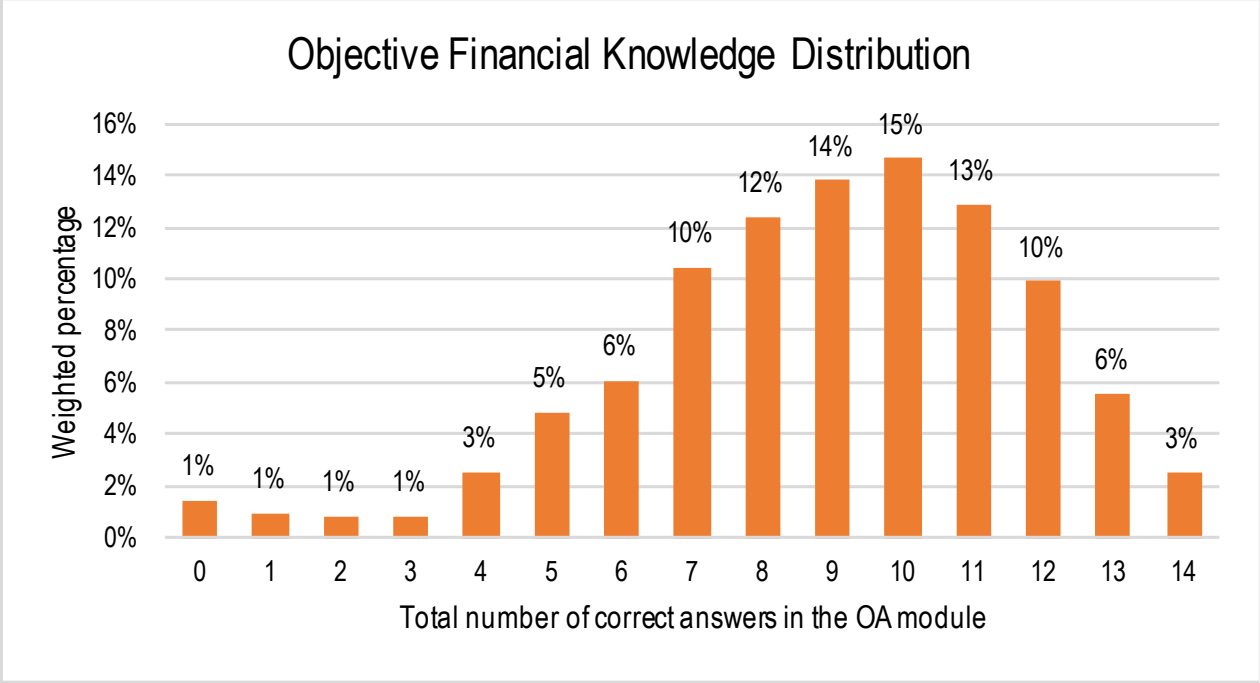
The 14-question *Objective personal assessment* (OA) module in the CFCS tests respondents' knowledge of basic financial concepts. These questions determine how much respondents know about concepts such as interest rates, inflation rates, stock market regulations, optimal strategies in money management, rationale behind savings, etc. Respondents who answer a lot of questions right are likely to be financially knowledgeable. Conversely, those who perform poorly on this module are likely to lack basic knowledge of personal finance. We derived a knowledge score for each respondent by summing up the total number of correct answers he or she got on the *Objective personal assessment* module. Thus objective assessment scores range from 0 to 14 for each individual. A "don't know" response to any question was counted as incorrect and scored as a zero.[3] Respondents who had any missing values or refusals were excluded from the analysis.

[3] Previous studies had excluded "Don't Know" responses and so had a lower proportion of zeros than shown here. Whether these respondents are included or excluded does not affect the results of either the descriptive or the multivariate analyses in any substantial way.

To examine the validity of this scale, we compared each question's mean score among quartiles of overall scale scores. Our analysis shows that most of the 14 questions do a good job distinguishing respondents with high levels of financial knowledge from those with relatively lower levels. Details of this analysis are presented in Appendix B.

The weighted distribution of objective assessment scores for Canadian adults aged 25 to 64 resembles a normal distribution, with a skew to the left (Figure 2). The skew is reflected in the fact that the mean score (8.70 correct answers out of 14) is lower than the median (9). Around 18 per cent of the population score quite high (12 or more correct answers), but around the same percentage get less than half (6 or fewer) of the answers correct.

Figure 2 Weighted distribution of objective assessment scores – Adults aged 25 to 64



Note: All calculations are weighted with population weights provided by Statistics Canada.

Indicator of subjective financial confidence

Information from the *Subjective personal assessment* (SA) module in the CFCS is used to construct an indicator of financial confidence/self-efficacy. With this module, respondents not only reflect on how knowledgeable they think they are, but also rate their skills in various domains such as keeping track of money, making ends meet, and shopping around to get the best financial products. Those with relatively high self-ratings are likely to have a positive view of their own financial knowledge and skills. In contrast, those with lower self-ratings are likely to have a low level of financial confidence/self-efficacy.

In accordance with previous analyses of CFCS data, we used only the first five questions in this module to construct a composite measure of confidence in one's own ability. For each question, respondents receive four points every time they rate themselves as "very knowledgeable" or "very good", three points every time they rate themselves as "knowledgeable" or "good", two points every time they rate themselves as "fairly knowledgeable" or "fairly good", and one point every time they rate themselves as "not very knowledgeable" or "not very good".

Respondents who had any missing values, don't knows, or refusals were excluded from the analysis, meaning that possible scores ranged from 5 to 20.[4]

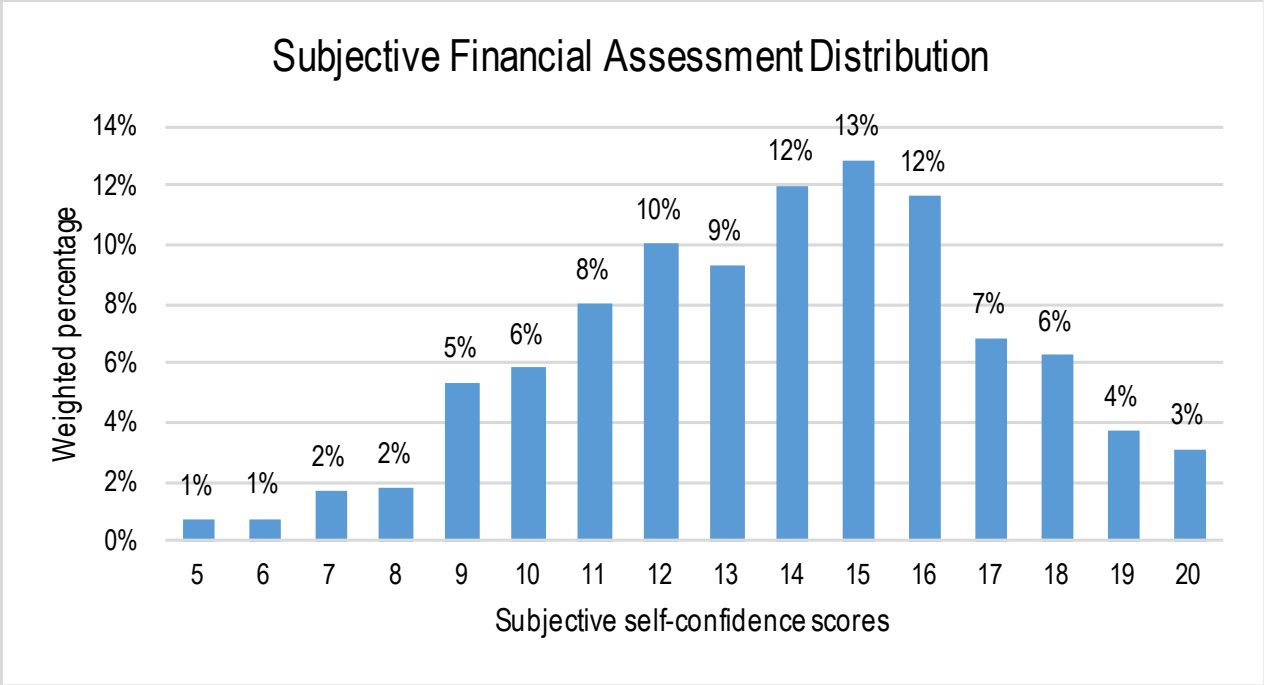
Although the validity of this five-item scale has not been extensively evaluated in other studies, our preliminary examination suggests that the scale is suitable for the purpose of the current study. Using an analytical process similar to the one conducted on the objective knowledge scale, we found that the five subjective assessment questions can all effectively sort people into appropriate quartiles of financial self-confidence. Further information of this analysis is provided in Appendix B.

The weighted distribution of the five-item subjective assessment composite indicator is shown in Figure 3. Using an analytical process similar to the one conducted on the objective knowledge scale, we found that the five subjective assessment questions can all effectively sort people into appropriate quartiles of financial confidence.[5] Compared to the financial knowledge score distribution, the curve for financial confidence scores is more symmetrical, with the mean (13.93 out of a possible 20) and median (14) almost identical. Both tails are substantial as well, with around 19 per cent of the population scoring 17 or higher, and another 17 per cent scoring 10 or lower.

[4] As a sensitivity check, we created an alternative self-confidence scale based on factor analysis results, and found that the factor loadings give each of the five items almost equal weights (all factor loadings are in the neighbourhood between 0.57 and 0.62). This indicates that all five items should be taken into consideration in a fairly equal manner when constructing the overall scale score. Therefore, to parsimoniously reflect their equal weights, the 5-item scale used in this study is the simple sum of the item scores.

[5] Although the validity of this five-item scale has not been critically evaluated in other studies, our preliminary examination suggests that the scale is suitable for the purpose of the current study. Further information of this analysis is provided in Appendix B.

Figure 3 Weighted distribution of subjective assessment scores – Adults aged 25 to 64



Note: All calculations are weighted with population weights provided by Statistics Canada.

The next subsection reviews how indicators of financial knowledge and financial confidence can be combined to capture their simultaneous effect on financial decision-making. This gives an indirect way to analyze the potential influence of cognitive bias on financial behaviour and outcomes.

Descriptive analysis

Methodology: Combining financial knowledge with financial confidence

Quartile thresholds were derived from the weighted distributions of the knowledge and confidence scores of adults aged 25 to 64, and these thresholds were used to define the following four groups:

1) **High knowledge, high confidence** group consists of those in the two highest quartiles (i.e., above the median) for both knowledge score and confidence score.
2) **High knowledge, low confidence** group is defined as those in the two highest quartiles (i.e., above the median) for knowledge, but in the two lowest quartiles (median or below) for confidence.
3) **Low knowledge, high confidence** group is defined as those in the two lowest quartiles (median or below) for knowledge, but in the two highest quartiles (above the median) for confidence.
4) **Low knowledge, low confidence** group is defined as those with gaps in both knowledge and confidence, i.e., those in the two lowest quartiles (median or below) for both measures.

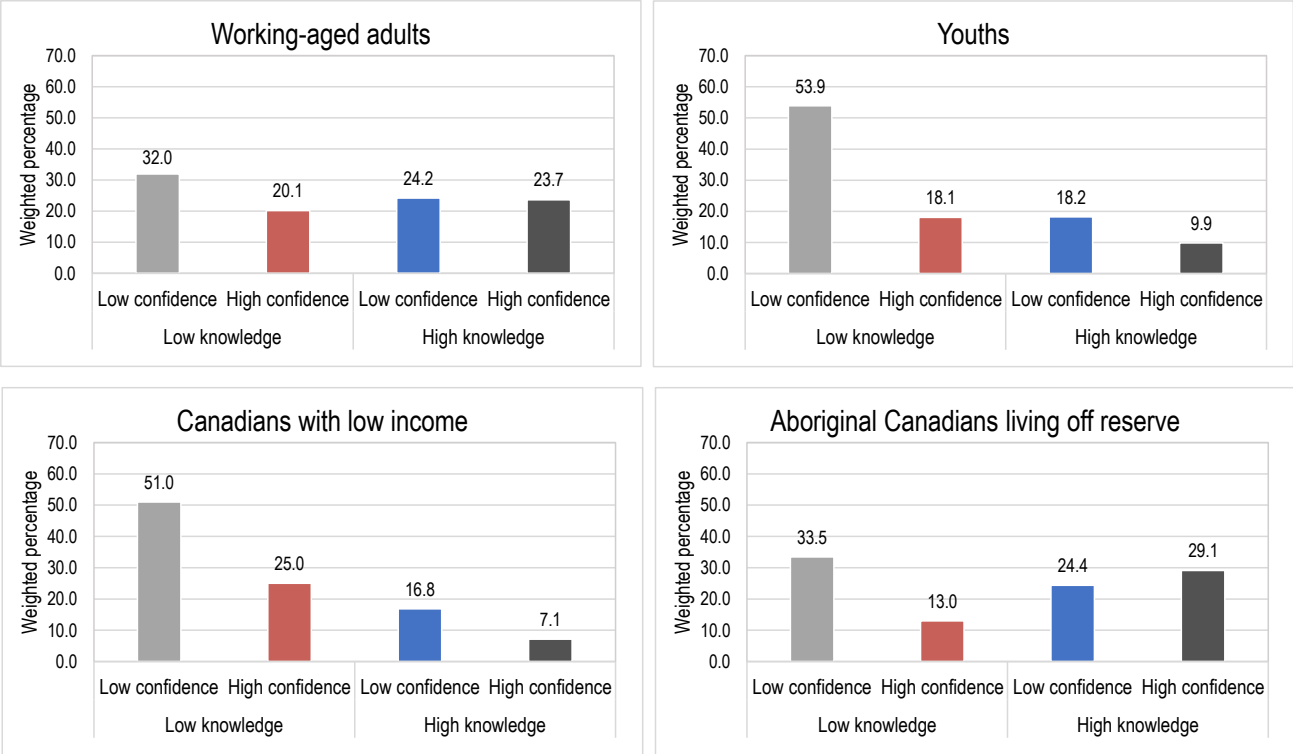
The descriptive analysis first explores the prevalence of each of the four groups above among the general population of working-aged adults (25 to 64). This population is then used as the reference for comparison with groups of particular policy interest such as Aboriginal Canadians living off reserve, Canadians with low-income, and youth. In other words, the quartile thresholds established for the reference population of 25 to 64 year olds are also used to define high and low knowledge as well as high and low confidence for i) Aboriginal Canadians living off reserve aged 25 to 64, ii) Canadians with low income aged 25 to 64 (defined as those in the lowest income quintile), and iii) youth aged 18 to 24. This allows us to compare the way these subpopulations are distributed with respect to knowledge and confidence in relation to the general population of working aged adults.

Finally, the distributions of the four groups with respect to various other demographic characteristics are presented.

Results

Figure 4 shows the distributions of the four groups with varying levels of financial knowledge and financial confidence, among the general working-aged population (25 to 64) as well as the subpopulations of youth aged 18 to 24, Canadians with low-income, and Aboriginal Canadians living off reserve.

Figure 4 Distributions of confidence relative to knowledge



Within the general population of working-aged adults, about a third (32 per cent) have low levels of financial knowledge as well as low financial confidence. In contrast, under a quarter of Canadian adults (23.7 per cent) are equipped with both high confidence and high knowledge to manage their personal finances effectively.

Low levels of both knowledge and confidence are much more common (more than 50 per cent) among youth and Canadians with low-income than among the general population, and high levels of both knowledge and confidence are uncommon (less than 10 per cent) in these subpopulations. The distribution of knowledge/confidence among Aboriginal Canadians living off reserve, on the other hand is not significantly different from the general population.[6]

In terms of mismatches between self-confidence and financial knowledge, slightly more than half of those with high levels of knowledge in the general population have relatively low self-confidence. This suggests that a substantial proportion of Canadians have little confidence in managing their finances despite above-average knowledge of the financial concepts. The proportion is even higher

6 There may be sample size and underreporting issues for Aboriginal respondents. For example, more than a third of respondents did not report whether or not they considered themselves Aboriginal persons. The data show that those who did not report on Aboriginal status tend to have lower levels of knowledge than those who did, so missing values may affect the results substantially.

among youth and Canadians with low-income — in each of these subpopulations, roughly two-thirds of those with high levels of knowledge have relatively low self-confidence.

Among those with low levels of financial knowledge in the general population, close to 40 per cent nonetheless have relatively high financial confidence. This suggests that a substantial proportion of Canadians may be doing relatively well in day-to-day money management despite below-average knowledge of the concepts. On the other hand, some of these respondents may be overconfident in their ability to manage their finances. Relatively unknowledgeable Canadians with low-income and youth are less likely to have high confidence than unknowledgeable members of the general population.

The distributions of the four knowledge/confidence groups with respect to various other demographic groups are presented in Figure 5.

The results show that within the population of working-aged adults, **low levels of both confidence and knowledge** are more common among:

- Women, compared to men
- Those without a partner, compared to those with a partner
- Those with high school or less, compared to those with post-secondary credentials
- Those not working, compared to those who are employed.

Among those with ***higher than average levels of knowledge***, incidence of ***low confidence*** is more common among:

- Younger (25 to 34), compared to older (45 and up) Canadians
- Women, compared to men
- Those without a partner, compared to those with a partner
- Those with college or less, compared to those with undergraduate or graduate degrees
- Those not working, compared to those who are employed.

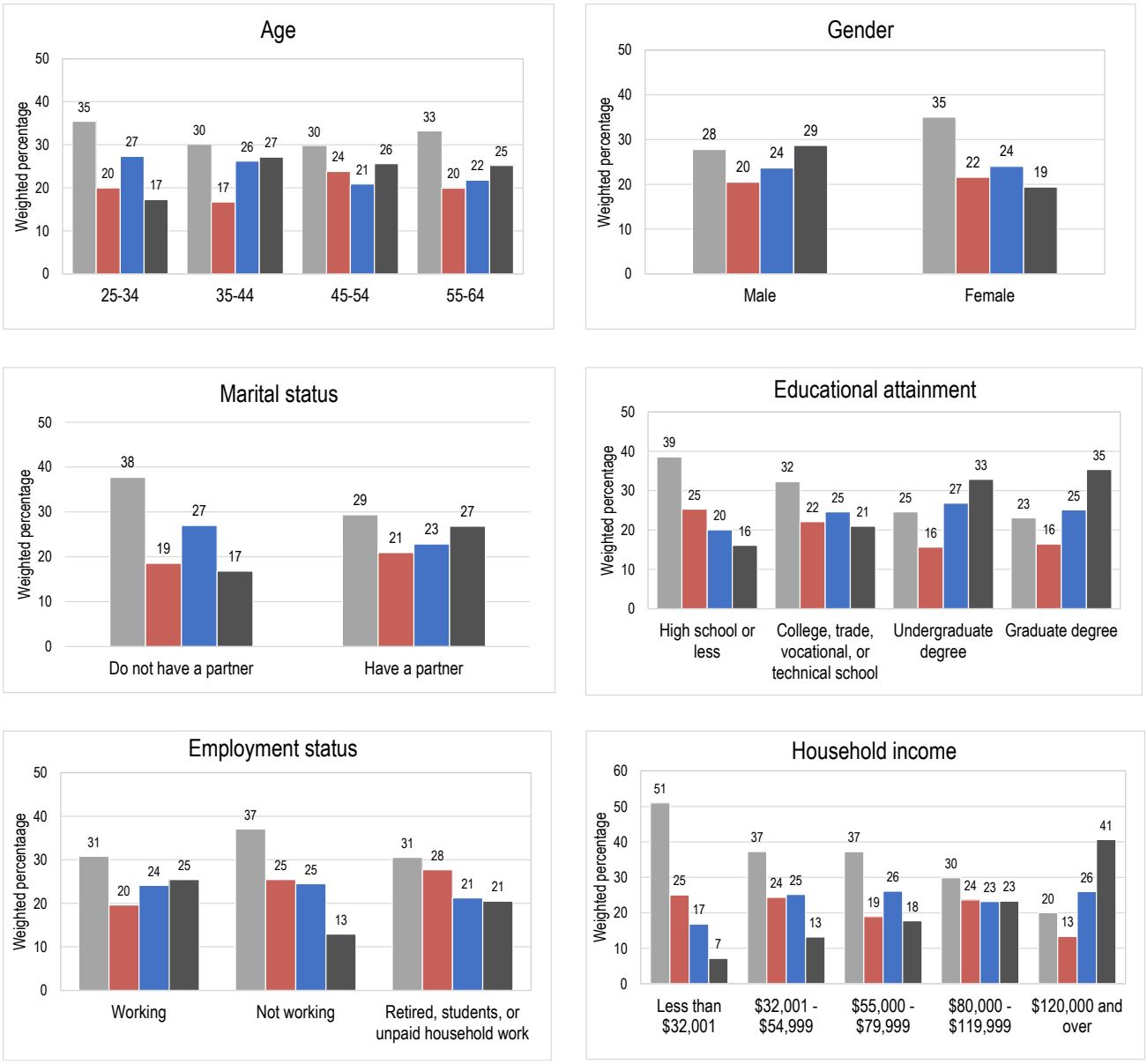
Among those with ***lower than average levels of knowledge***, incidence of ***high confidence*** is more common among:

- Men, compared to women
- Those with a partner, compared to those without a partner.

A multivariate model, predicting confidence score as a function of knowledge score and a full range of demographic characteristics is shown in Appendix D. The results are largely consistent with those reported above, and show that at a given level of knowledge, men have significantly higher levels of confidence than women, those who are 45 or older have significantly higher levels of confidence than those aged 25 to 34, those with higher household incomes have significantly higher levels of confidence than those with lower incomes, those who have a partner have significantly

higher levels of confidence than those without a partner, and those with graduate degrees have significantly higher levels of confidence than those with high school or less.

Figure 5 Relative confidence by demographic characteristics



Note: While this graph highlights the interesting demographic trends, full descriptive results are also available in Appendix C.

Overall, the descriptive analysis has shown a few crucial individual characteristics that are related to different levels of financial knowledge and financial confidence. The results of the descriptive analysis and their associated implications are highlighted in Box 2.

Box 2 Summary of the descriptive analysis

- Roughly one-third of Canadian adults aged 25 to 64 have low levels of both financial knowledge and confidence in their ability to manage their finances. This suggests that there are substantial gaps in financial knowledge as well as financial confidence to be filled. The problem is even worse among youth aged 18 to 24 and Canadians with low-income, where over 50 per cent have below average scores in both knowledge and confidence measures.
- In terms of knowledge/confidence discrepancies, about half of those with above average knowledge in the general population aged 25 to 64 have below average levels of confidence. This suggests that a substantial proportion of relatively knowledgeable Canadians have little confidence in managing their finances. This issue is of even greater concern among youth and Canadians with low-income, where roughly two-thirds of those with high levels of knowledge have relatively low self-confidence.
- Other demographic groups at risk for low confidence, low knowledge or both include women, those without a partner, and those with lower levels of educational attainment.
- There is no evidence for a significant difference between Aboriginal Canadians living off reserve and the rest of the population in terms of either financial knowledge or financial confidence. Nevertheless, further information may need to be collected, as the current dataset may have several quality and sample size issues that affect the results pertaining to this subpopulation.

Multivariate analysis

Methodology

Results of the descriptive analysis indicate that there are systematic variations in financial knowledge and confidence across different demographic groups.

Because both financial knowledge and financial confidence are affected by demographic characteristics, it is necessary to control for these characteristics in order to isolate the potential effects that knowledge and confidence have on financial behaviour and outcomes. In particular, age, gender, marital status, household size/composition, presence of children under the age of 18, educational attainment, employment status, Aboriginal status (off reserve), and household income are included as covariates.

Objective and subjective assessment scores were centred on the mean and standardized. In other words, the mean was set to zero, and a given person's standardized scores indicated both the direction (negative if smaller than the mean, positive if larger) and distance (in number of standard deviations) from the mean. In addition to the demographic covariates listed above, both standardized objective and subjective assessment scores were included in the multivariate regression models. Thus, the coefficient associated with the main effect of confidence is the effect of confidence on a person with average knowledge (i.e., when standardized knowledge score equals zero) and vice versa.

In addition, the product of the standardized objective assessment score and subjective assessment score was included in the regression model to capture their interactive effect on the outcomes of interest. This interaction term shows whether the effect of confidence changes as knowledge increases or decreases.

Behavioural indicators within the domain of 1) money and debt management and 2) future planning and saving were used as outcome measurements. The structure of the regression models used in this multivariate analysis can be summarized as follows:

$$\begin{aligned} Outcome\ of\ interest = {} & \alpha + \beta_1 Standardized\ OA\ score + \beta_2 Standardized\ SA\ score \\ & + \beta_3\ Standardized\ OA \times Standardized\ SA \\ & + \beta_4 Demographics_1 + \cdots + \beta_{13} Demographics_9 + \epsilon \end{aligned}$$

where α denotes a constant;

Standardized OA score denotes the standardized objective assessment score;

Standardized SA score denotes the standardized subjective assessment score;

$\beta_1\ to\ \beta_{13}$ capture the effect of each predictor variable on the outcome of interest; and

$Demographics_1\ to\ Demographics_{13}$ correspond to the control demographic variables.

The next section discusses the analytical results in detail.

Results

The next three subsections present a number of graphs depicting the results of the multivariate analysis. Each graph demonstrates how financial outcomes change for the demographically average person at different levels of knowledge and confidence. For each graph, the effect of *increasing* knowledge is seen in the slope of the lines going from *left to right*, whereas the effect of confidence is depicted as the distance between the lines. The red line illustrates the highest level of confidence (2 standard deviations above the mean subjective personal assessment score), the orange line shows an above-average level of confidence (1 standard deviation above the mean). The black line depicts an average level of confidence. The light blue line presents a below-average level of confidence (1 standard deviation below the mean), and the dark blue line represents the lowest level of confidence (2 standard deviations below the mean). A brief guide to interpreting the graphs is given in the box below.

Visual aid: Graph layouts and statistical interpretations

To make it easier to follow the graphs, this section provides a summary of the graph layout that further explains what they illustrate.

For each graph, the slopes of the lines depict the main effect of knowledge on behaviour. The distance between lines shows the main effect of confidence. Whether the lines remain parallel to each other, or whether they cross at a certain point, gives indications of the interactive effect that knowledge and confidence may have on behaviour.

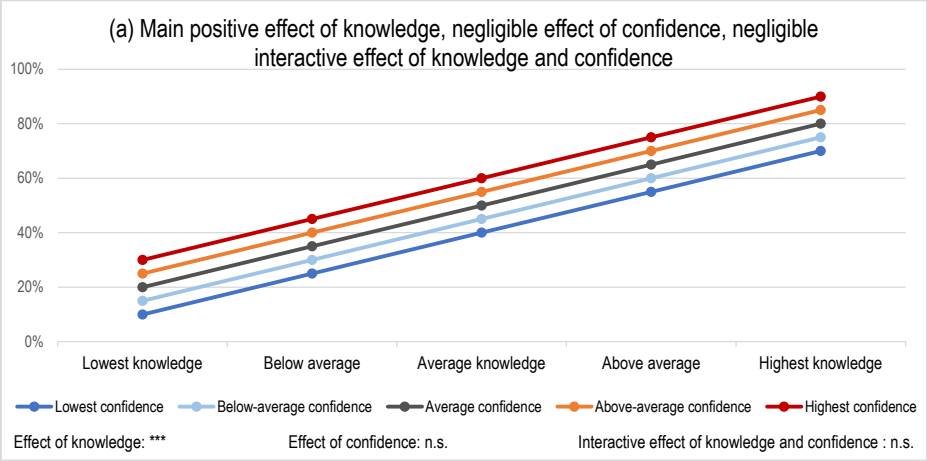
Figure 6 provides some **hypothetical** examples of these kinds of effects. It is important to note that the graphs in Figure 6 do **not** represent actual results. What they offer is an overview of the possible patterns that the data may show, which makes it easier to understand and interpret the results of the multivariate analysis.

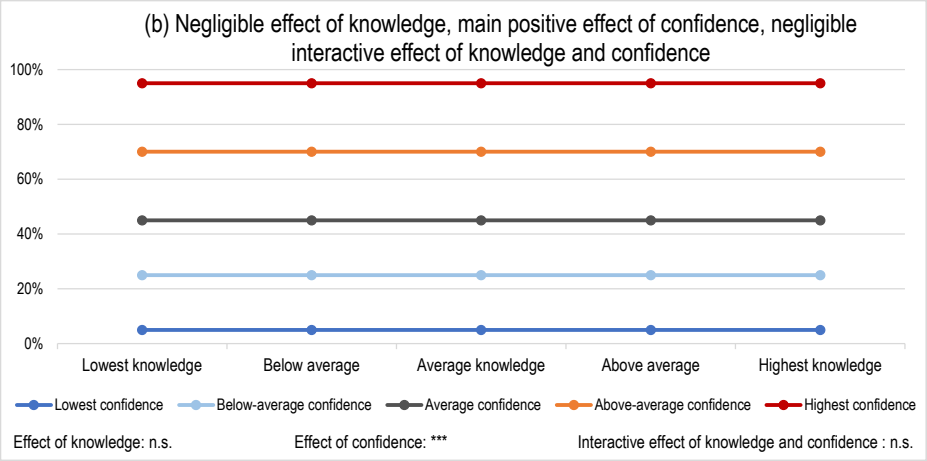
Substantial main effect of knowledge – Panel (a) of Figure 6: the lines are all upward-sloping, while the distances between the lines are relatively small. This indicates that the main effect of knowledge on behaviour is substantial, while the effect of confidence is negligible.

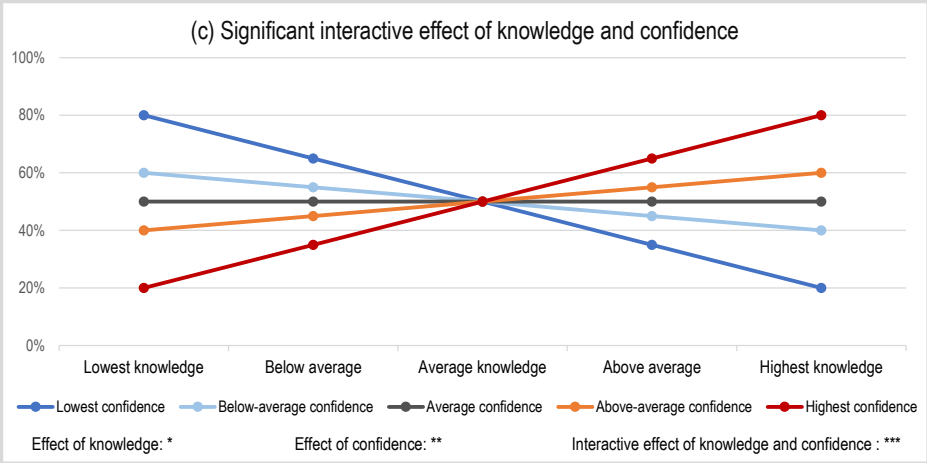
Substantial main effect of confidence – Panel (b) of Figure 6: the lines are all flat, with considerable gaps between them. This indicates that there is no main effect of knowledge on behaviour, while the effect of confidence is sizeable.

Substantial interaction effect – Panel (c) of Figure 6: The lines cross at a certain point. In this particular case, knowledge enhances the effect of *high* confidence, as the red line is upward-sloping. At the same time, knowledge hampers the effect of *low* confidence, as the dark blue line is downward-sloping.

Figure 6 Visual aid with hypothetical examples





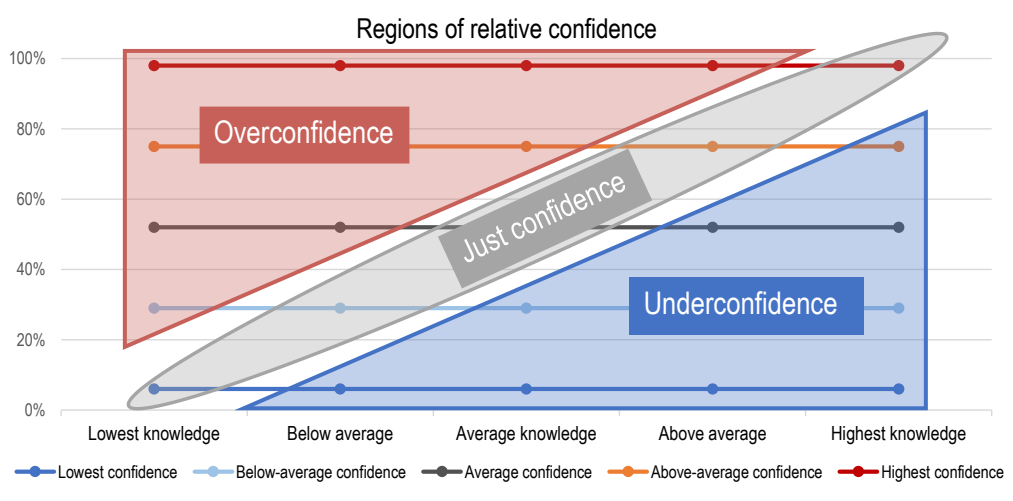


Visual aid: Graph layouts and statistical interpretations (continued)

It would be imprecise to merely use the trends of the lines to gauge the effect of knowledge, confidence, and their interaction on behaviour. Rather, to determine if these effects are significantly different from 0, statistical tests are conducted. Levels of statistical significance are denoted at the bottom of the graphs to show the results of these tests. Statistical significance at the level of 10 per cent is denoted with *, 5 per cent with **, and 1 per cent with ***. If the effect is not significant, it is denoted as "n.s.". Although analyses that test well-established hypotheses commonly use a significance threshold of 5 per cent or lower, for this more exploratory analysis, we loosen the criteria slightly and report results at the 10 per cent level as well in order to identify potentially interesting patterns for future study.

Finally, behavioural patterns related to possible overconfidence, just confidence, and underconfidence can also be viewed from the graphs. To reiterate, overconfidence is defined as having a confidence ranking that is relatively higher than the knowledge ranking in the population. The reverse is true for underconfidence. Just confidence refers to the groups whose confidence rankings match their knowledge rankings. Figure 7 gives an example to allow simple navigation of these regions of relative confidence in the graphs.

Figure 7 Regions of relative confidence



The next three subsections review the multivariate results within the domains of 1) current money and debt management, 2) general planning and savings for the future, and 3) specific planning and savings for retirement. Because of the linear specification of the regression models, it is possible that the results of the extreme cases (*highest knowledge, highest confidence* and *lowest knowledge, lowest confidence*) may be outside of the 0 per cent – 100 per cent bounds. This is because the trends depicted in the graphs reflect more closely the qualitative nature of the results, rather than their numerical values. Because of the imprecision arising from the linear nature of the model specification, each point on the graphs should not be viewed in isolation. Instead, the results illustrated in the graphs should be interpreted as a comprehensive whole. Full regression results can be found in Appendix E.

Current money and debt management

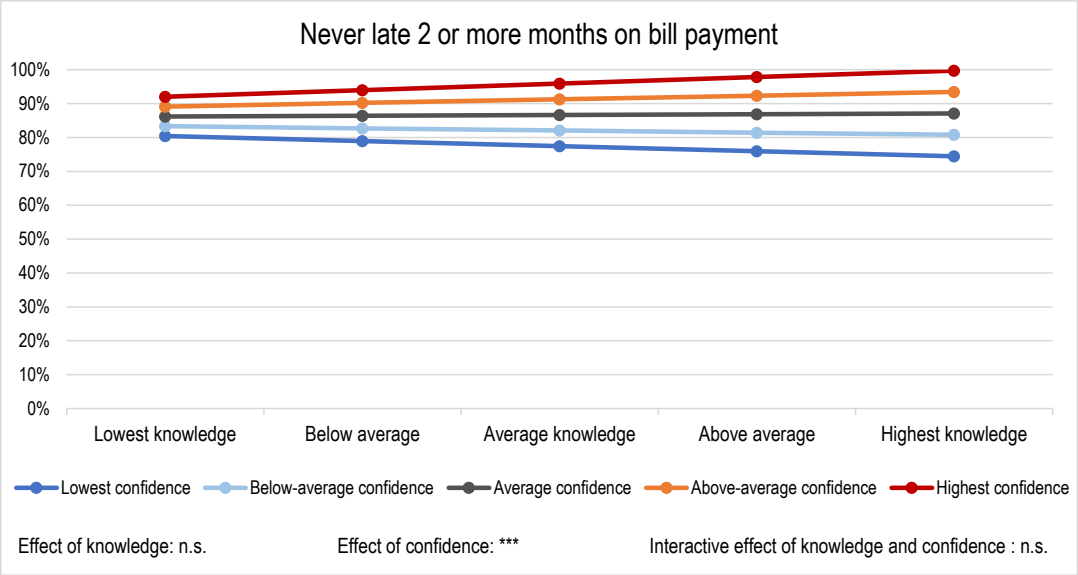
In general, confidence is a better predictor than knowledge for outcomes related to current debt and money management. The less confident are more likely to report poor outcomes in this domain, even if they have high levels of knowledge.

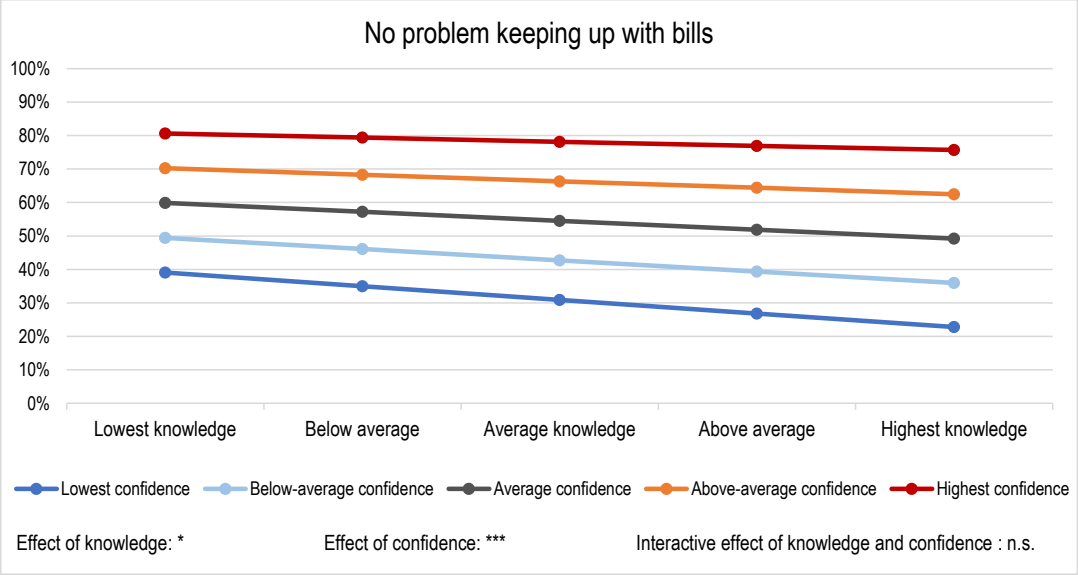
For example, Figure 8 shows how knowledge and confidence are linked with bill payment habits. The results show no significant difference in never being late with bill payments between respondents with high knowledge and those with low knowledge, indicated by the relative flatness of all the lines on the top panel of Figure 8. The effect of knowledge on keeping up with financial commitments (bottom panel) is marginally significant but *negative*, as those with higher levels of knowledge are slightly *less* likely to keep up than those with lower levels of knowledge.

In contrast, there are significant differences in bill payment habits between high- and low-confidence respondents, as the distances between any two adjacent lines are substantial. In particular, those with the high levels of confidence are less likely to be two or more consecutive months late in their bill payments, and more likely to have no problem keeping up with their regular bills and financial commitments, even if their level of financial knowledge is low. In contrast, those with low levels of confidence are more likely to be late or to have trouble paying their bills, even if they have high levels of knowledge.

As will be discussed in greater detail below, most money and debt management indicators are strongly tied to confidence and either not linked or weakly linked in a negative way with knowledge.

Figure 8 Bill payment



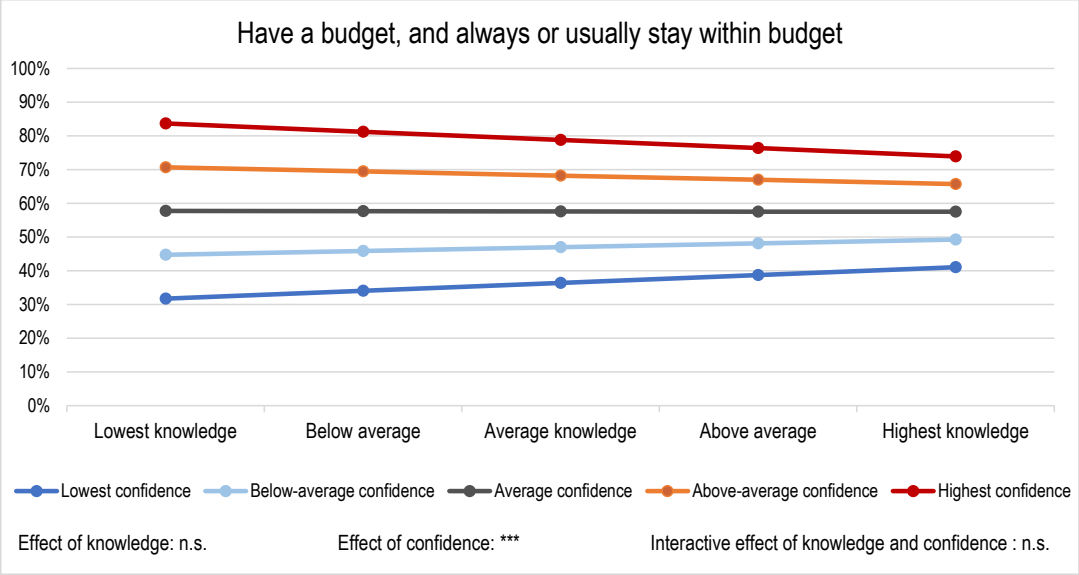


Note: If the effect of knowledge, confidence, or their interaction is statistically significant, stars are used to specify the level of significance. Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$). If the effect is not significant, it is denoted as "n.s." ($p > 0.1$).

Similar effects of confidence (and lack of effect of knowledge) on budgeting habits are illustrated in Figure 9. The relatively flat lines show that among those with a budget, level of financial knowledge does not distinguish those that can stay within their budget from those that cannot, holding demographic characteristics constant. On the other hand, the distance between the lines illustrates

a strong positive effect of confidence, where higher levels of confidence predict greater likelihood of staying within budget, regardless of knowledge.

Figure 9 Budgeting

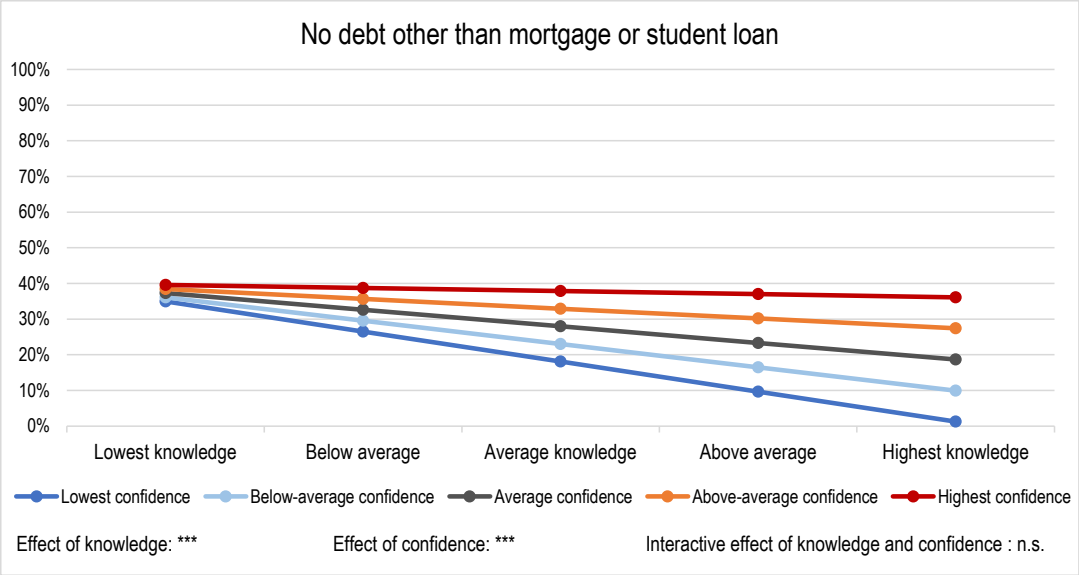


Note: If the effect of knowledge, confidence, or their interaction is statistically significant, stars are used to specify the level of significance. Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$). If the effect is not significant, it is denoted as "n.s." ($p > 0.1$).

Regarding debt management, more than 75 per cent of working-aged adults reported having some type of debt. Figure 10 shows how debt load varies with confidence and knowledge. After controlling for demographic characteristics, the effect of confidence shows up as positive: those with high levels of confidence have a greater likelihood of holding no debt other than mortgages or student loans. On the other hand, those with low levels of self-confidence are likely to be burdened with other consumer debt (i.e., non-student loan or mortgage).

In this case, the downward sloping lines indicate a significant negative effect of knowledge. This effect is most prominent among those with the lowest level of confidence (dark blue line). In other words, the combination of high knowledge and low confidence is especially likely to be linked with high debt load, suggesting that the ***underconfidence*** in relation to knowledge of this segment of the population would appear to be justified.

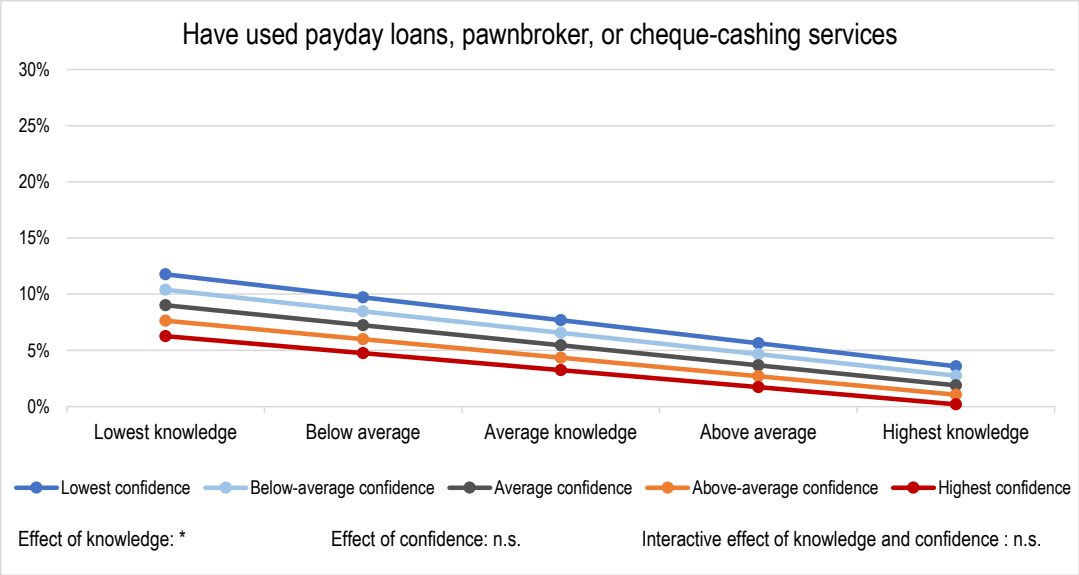
Figure 10 Debt



Note: If the effect of knowledge, confidence, or their interaction is statistically significant, stars are used to specify the level of significance. Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$). If the effect is not significant, it is denoted as "n.s." ($p > 0.1$).

Figure 11 shows the effect of knowledge and confidence on the use of alternative financial services such as payday loans, pawnbroker, and non-bank cheque-cashing services. The power of the analysis was restricted by the small sample size of those who reported using these services. As a result, few effects were significant. There was a marginally significant main effect of knowledge, as individuals with above-average knowledge levels were less likely to resort to these expensive financial services, as depicted by the downward-sloping lines.

Figure 11 Use of alternative financial services



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Summary of findings

Overall, the results suggest that confidence plays a crucial role in daily money and debt management. Across all knowledge levels, those who are confident in their financial capability are doing better keeping up with their bills, staying within budget, and avoiding debt. Table 1 summarizes the statistical relationships that knowledge and confidence have on behaviours in this domain.

Table 1 Summary of findings – Money and debt management

Variable	Effect of knowledge	Effect of confidence	Interactive effect
Never late on bills		***	
No problems with bills	*	***	
Budgeting		***	
Debt	***	***	
Use of alternative services	*		

Note: (1) Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$).

Putting these findings in the context of Bandura's perpetual cycle helps facilitate their interpretation. Particularly, social cognitive theory would postulate that performance outcomes within the domain of current money and debt management can be observed on a regular, ongoing basis. Consequently, people who have been doing well can continuously reflect on their positive financial results, develop an effective analytical strategy over time, and constantly update their self-efficacy accordingly.

The fact that self-efficacy is a strong predictor of desirable behaviour in this financial domain suggests that learning-by-doing may be crucial in this regard, as self-reflection on past performance is the key factor that determines self-efficacy.

The apparently negative effect of knowledge on two of these outcomes (keeping up with financial commitments and carrying debt other than student loans or mortgages) is interesting and suggests further study. It may be that those with good knowledge of financial concepts are strategic in planning debt in order to facilitate some other financial outcome (e.g., borrowing to invest in an RRSP, if the resulting tax deduction is higher than interest payments associated with the debt). Box 3 summarizes the results and briefly discusses policy implications. The section that follows presents the effect of knowledge and confidence on general planning and saving.

Box 3 Summary of money and debt management results, with policy implications

- Knowledge of financial concepts appears to play a secondary role in ongoing money and debt management, as confidence is generally a stronger predictor of desirable and effective decision-making in this behavioural domain.
- Therefore, training programs aiming to enhance Canadians' ability to manage their ongoing finances need to focus on financial confidence, and identify possible reasons (including cognitive bias) for low financial confidence before designing and targeting interventions.
- Knowledge may be important where decisions involve product choice (e.g., deciding whether or not to make use of alternative financial services such as payday loans).
- The conceptual and empirical findings suggest that learning-by-doing may be the key in this behavioural domain, as people who are successful in handling their daily money matters may be effectively learning from their own experience. Identifying best practices from people with high confidence may be a way to inform the design of interventions.

General planning and saving

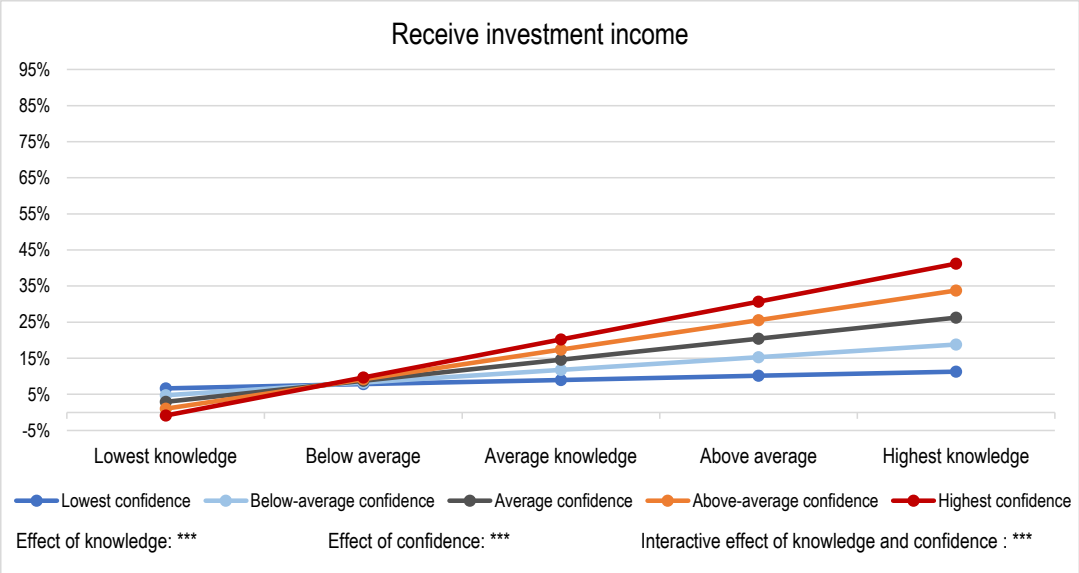
When it comes to planning and saving for the future, confidence and knowledge may interact to influence behaviour in interesting ways. Mismatches between knowledge and confidence are associated with poor planning and savings outcomes in this regard. Specifically, after holding demographics constant, planning and saving outcomes are relatively poor for both the ***underconfident*** (those with high levels of knowledge but low confidence), and the ***overconfident*** (those with low levels of knowledge but high confidence).

This pattern is well-illustrated in investment behaviour (Figure 12). Active investment behaviour can be an indicator of good planning habits — from the CFCS, we use receiving investment income in the past 12 months as an indicator for active investment behaviour. This variable places less emphasis on savings vehicles and instead focuses on interest, dividends, capital gains, and other income earned from investments. Both confidence and knowledge have a significant effect on investment income, with higher knowledge and higher confidence predicting higher likelihood of receiving investment income.

However, the cross pattern of the lines in Figure 12 indicates a significant interaction between knowledge and confidence. Poor outcomes are predicted for both the ***underconfident*** (those with high levels of knowledge but low levels of confidence, depicted by the dark blue and light blue dots on the right-hand side of the graph) and the ***overconfident*** (those with low levels of knowledge but high levels of confidence, depicted by the red and yellow dots on the left-hand side of the graph).

When confidence is low, increasing levels of knowledge seem to only make a small, if not negligible, effect on investing behaviour, as the two blue lines are relatively flat. In contrast, the steep red and orange lines suggest that when confidence is high, acquiring more knowledge can lead to more active investing behaviour.

Figure 12 Investing behaviour



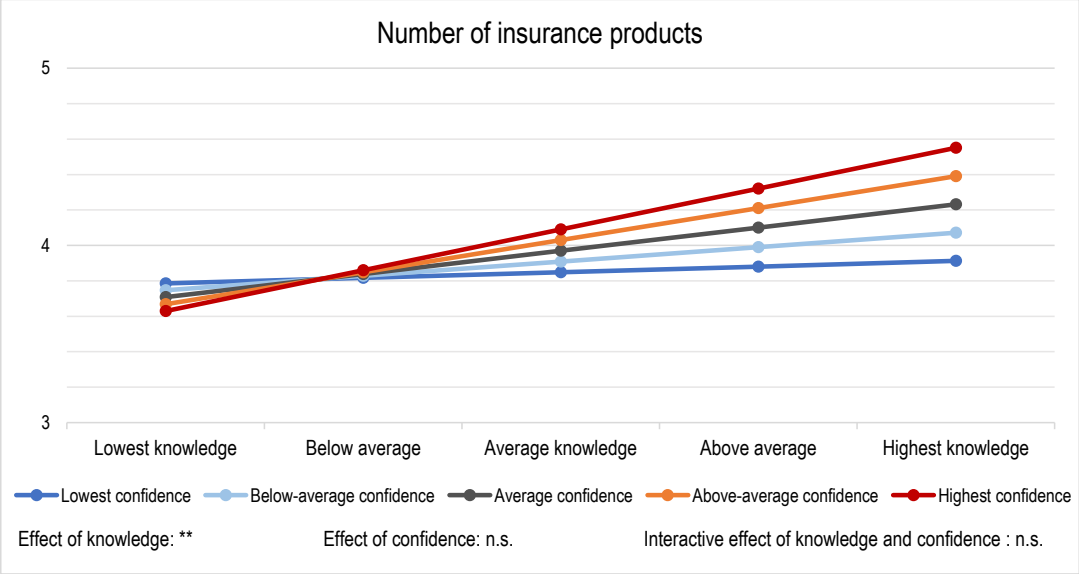
Note: If the effect of knowledge, confidence, or their interaction is statistically significant, stars are used to specify the level of significance. Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$). If the effect is not significant, it is denoted as "n.s." ($p > 0.1$).

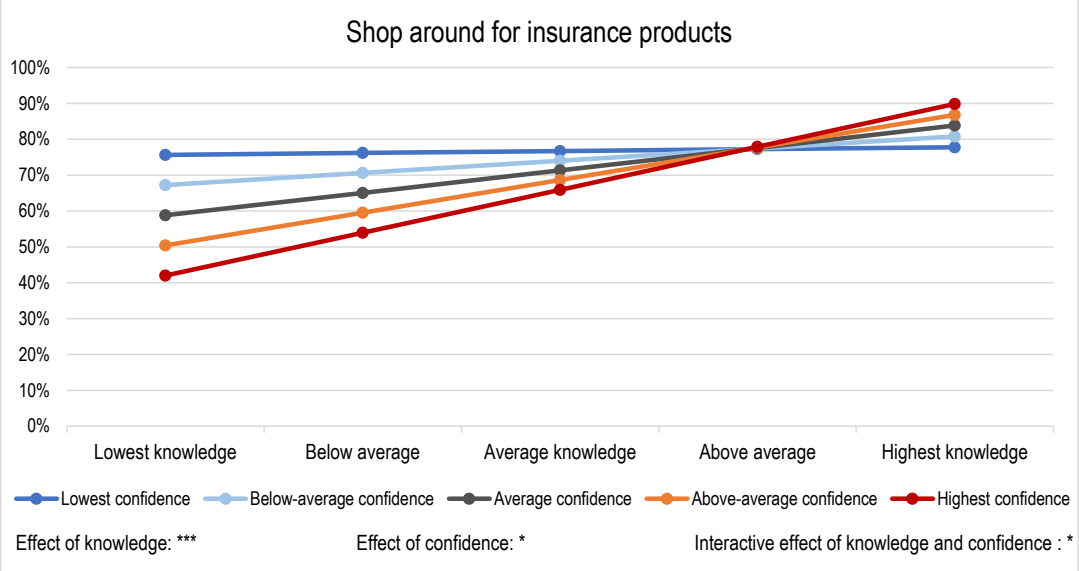
A similar interaction effect is observed when it comes to shopping around for insurance products, which is illustrated in the bottom panel of Figure 13. Though main effect of confidence on shopping around for insurance products is significant, the significant interaction effect reveals that

confidence alone is not enough, as confident individuals tend to choose more diversified insurance providers only if their confidence is coupled with a high level of knowledge.

The top panel of the graph shows the importance of knowledge in holding a greater number of insurance products, while the effects of confidence and the interaction between knowledge and confidence are non-significant.

Figure 13 Insurance choice

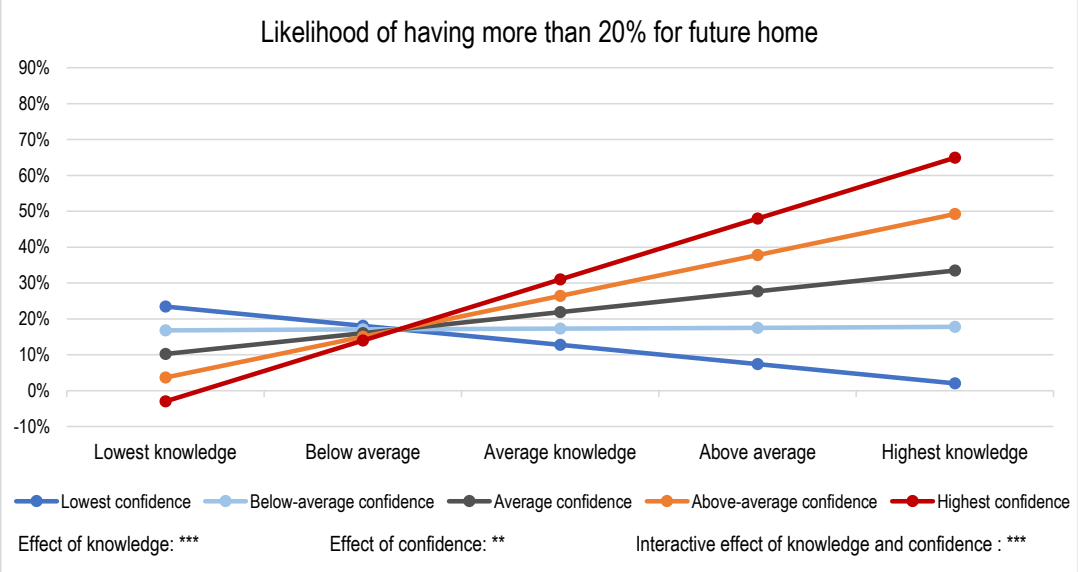




Note: If the effect of knowledge, confidence, or their interaction is statistically significant, stars are used to specify the level of significance. Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$). If the effect is not significant, it is denoted as "n.s." ($p > 0.1$).

An interaction between knowledge and confidence is also observed in the realm of saving for home purchase. As shown in Figure 14, the ***overconfident*** (high confidence, low knowledge) and the ***underconfident*** (high knowledge, low confidence) are less likely than other home buyers to have 20 per cent or more saved for a down payment on their future home. Again, self-confidence in financial capability needs to be coupled with sufficient levels of financial understanding in order to lead to desirable levels of saving for such major purchases.

Figure 14 Savings for major purchase



Note: If the effect of knowledge, confidence, or their interaction is statistically significant, stars are used to specify the level of significance. Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$). If the effect is not significant, it is denoted as "n.s." ($p > 0.1$).

Summary of findings

Overall, in terms of general planning and saving for the future, those who do best have high levels of both knowledge and confidence. As was found with debt and money management outcomes, those with low levels of confidence tend to experience poor outcomes, even if their level of knowledge is high. This may reflect the presence of cognitive bias, as procrastination and status quo bias have been found to be associated with both low self-efficacy and poor savings outcomes.

In contrast to what was found with debt and money management outcomes, those with high confidence but low knowledge do no better in the domain of general planning and saving than those with high knowledge but low confidence. Poor investment outcomes for those with above average confidence but below average knowledge is consistent with other empirical findings from the research literature and may reflect the greater demands on information processing associated with choosing products in a saving context.

Table 2 provides a summary of the findings with respect to general planning and saving.

Table 2 Summary of findings – General planning and saving

Variable	Effect of knowledge	Effect of confidence	Interactive effect
Investment income	***	***	***
Number of insurance products	**		
Shop around for insurance	***	*	*
Saved more than 20% for future home	***	**	***

Note: (1) Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$).

Box 4 summarizes the results and briefly discusses the resulting policy implications. The next section reviews planning and saving outcomes related specifically to retirement.

Box 4 Summary of general planning and saving results, with policy and research implications

- Knowledge of financial concepts and confidence both play important roles in general planning and saving outcomes. Poor outcomes are observed among those whose high level of knowledge may be negated by their poor self-confidence, as well as among those who possess high levels of confidence but may lack the knowledge required to make effective investment and savings decisions.
- Training programs aiming to enhance Canadians' ability to invest and save need to focus on identifying possible reasons including cognitive bias for both low and inappropriately high (i.e., coupled with low knowledge) self-confidence in order to design and target effective interventions. Providing knowledge alone may not be enough to counter the effects of overconfidence, as overconfidence is often linked with selective processing of information.
- In addition to underlining once again the importance of low confidence and the possible cognitive biases linked with it, these results imply that an overconfident mindset is also linked with poor planning and saving habits. Further research needs to be conducted to gain a better understanding of the complexity and range of psychological factors linked with poor outcomes in this domain, and to identify the appropriate strategies to counter their effects.

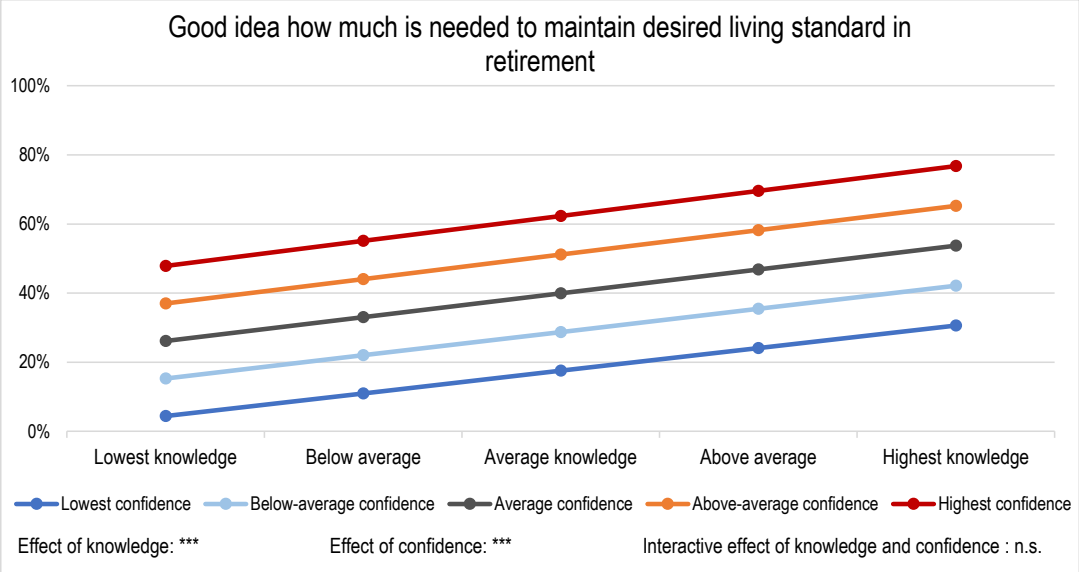
Retirement planning and saving

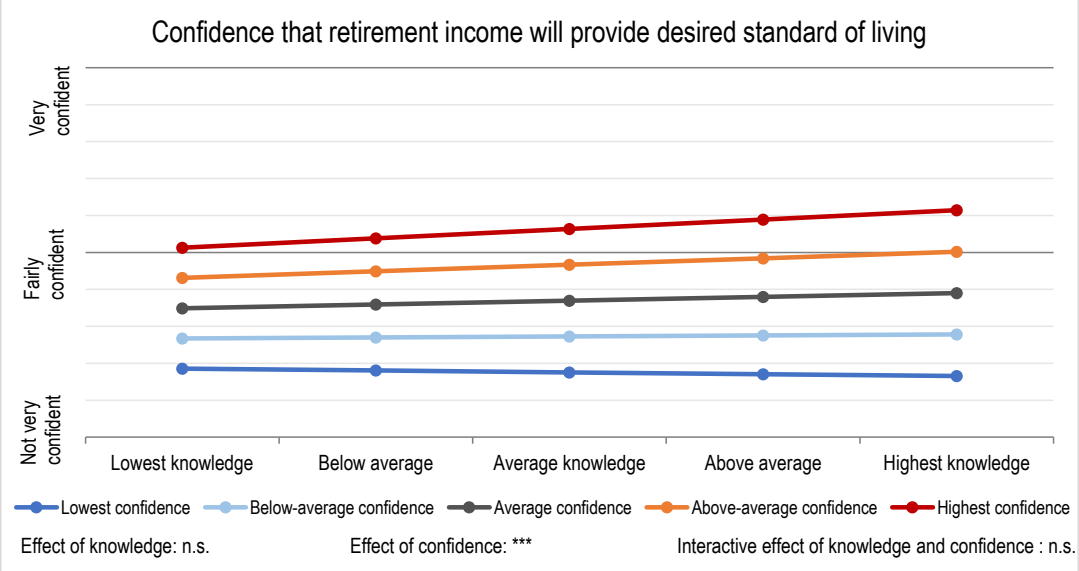
Similar to the domain of general planning and saving, decision-making related to retirement planning and saving requires both sufficient understanding of financial concepts as well as adequate financial confidence.

For example, both confidence and to a lesser extent knowledge are linked with feeling prepared for retirement, as illustrated in Figure 15. The distance between the lines in both panels indicates that

more confident individuals are more likely to 1) have a good idea how much is needed to maintain the desired standard of living during retirement, and 2) be confident that their retirement income will provide this desired standard of living. Knowledge is also a significant predictor of knowing how much is needed to maintain the desired standard of living during retirement, but not believing that their retirement income will actually provide this desired standard of living.

Figure 15 Feeling prepared for retirement





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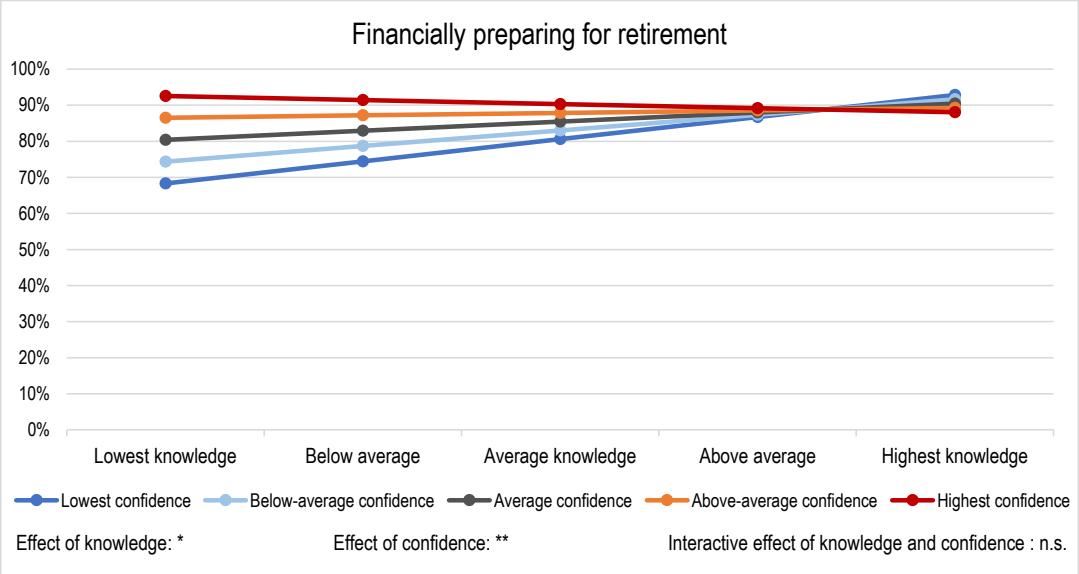
In terms of financial preparation for retirement, Figure 16 shows that those with high levels of both confidence and knowledge are likely to report that they are financially preparing for retirement. Only those with low levels of both knowledge and confidence show a trend towards lower levels of financial preparation.

Figure 16 Financial preparation for retirement

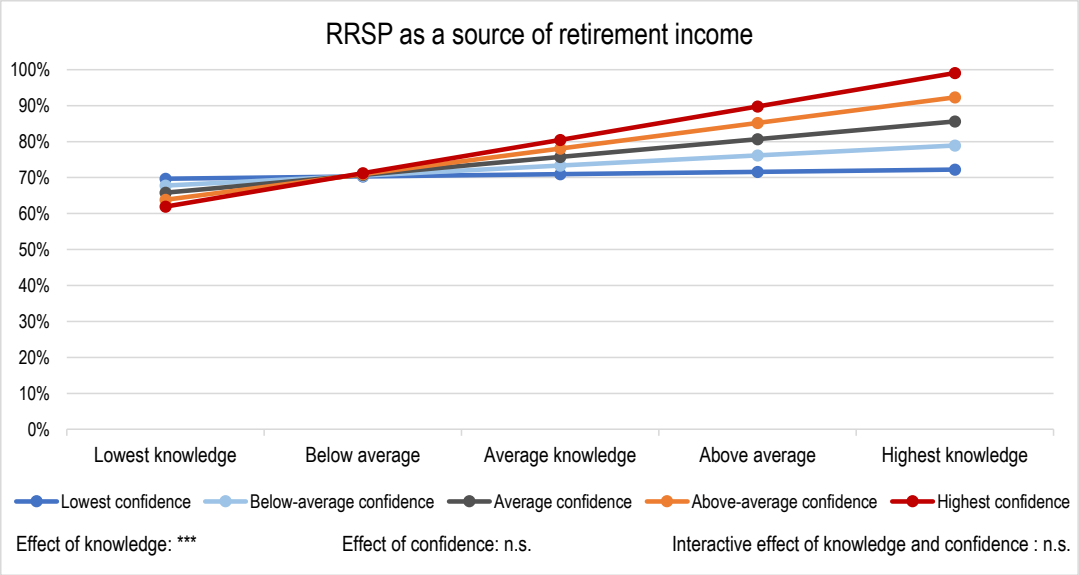


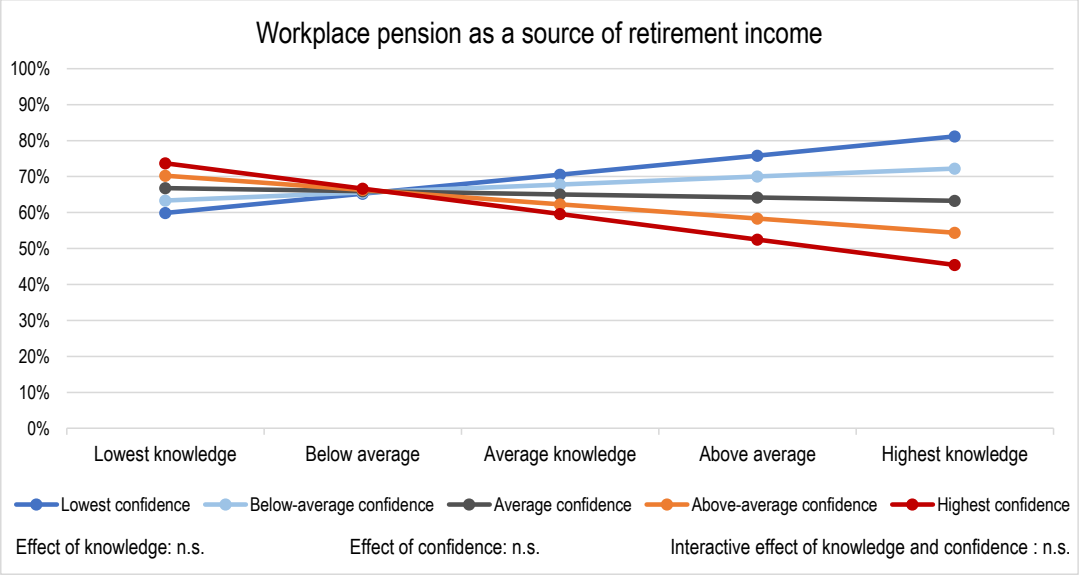
Note: If the effect of knowledge, confidence, or their interaction is statistically significant, stars are used to specify the level of significance. Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$). If the effect is not significant, it is denoted as "n.s." ($p > 0.1$).

However, even though they say they are preparing financially for retirement at roughly the same level, these various groups appear to be preparing in different ways. As shown on the top panel of Figure 17, those with high knowledge and high confidence are the most likely to report RRSPs as a source of retirement income. In contrast, the bottom panel of Figure 17 shows that those with high knowledge/low confidence and high confidence/low knowledge are the most likely to rely on workplace pensions as a source of retirement income (though the trend is not statistically significant as a result of low sample size reporting source of retirement income).

These patterns may reflect a positive impact on investor knowledge of having to use RRSPs rather than relying solely on workplace pensions for retirement saving — though we cannot determine from the data the degree to which pension contributions are voluntary and self-managed (which would require higher levels of knowledge than automatic contributions into default savings plans).

Figure 17 Sources of retirement income





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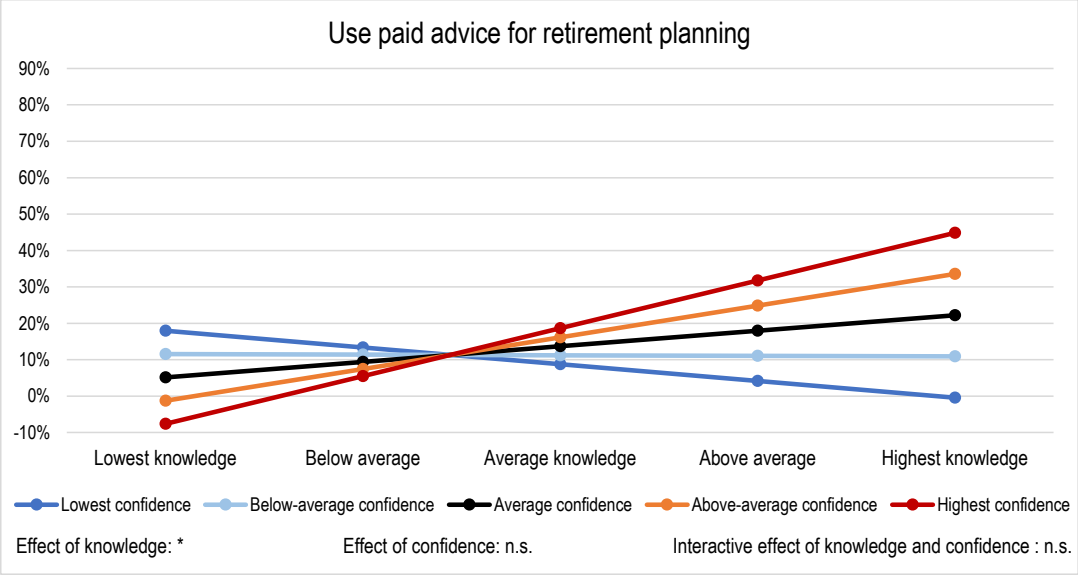
Identifying the groups that are most likely to obtain paid professional advice offers further insight into how knowledge and confidence may affect retirement planning.

Among those who use retirement planning advice, knowledge is a significant predictor of being willing to pay for it (Figure 18). Consistent with the research literature, those with high confidence

but low knowledge (the ***overconfident***) are less likely to think they need paid advice. In contrast, those with both high knowledge and high confidence are most likely to use paid financial advice, perhaps because they are the most likely to see the value in such a service and select an advisor whose expertise is closely aligned with their own interests.

Though the interaction term is not significant, there is also a trend showing that those with high knowledge but low confidence (the ***underconfident***) are less likely to use paid advice for retirement planning, even though they feel like they are not adequately prepared for retirement. This group may lack the self-control to absorb the immediate costs required to invest in further financial education, whether it involves self-directed learning or advice seeking.

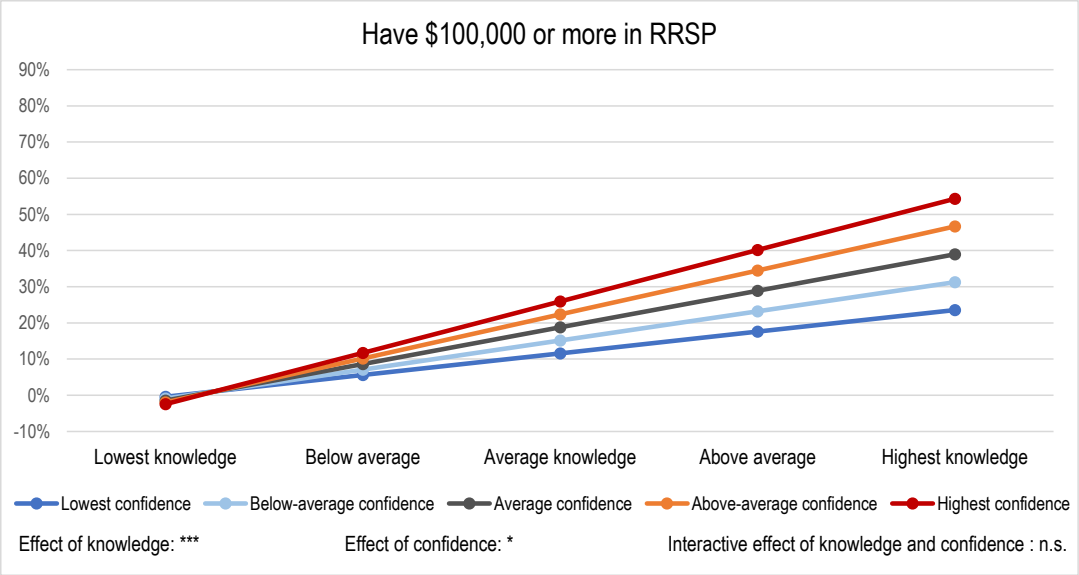
Figure 18 Retirement planning advice

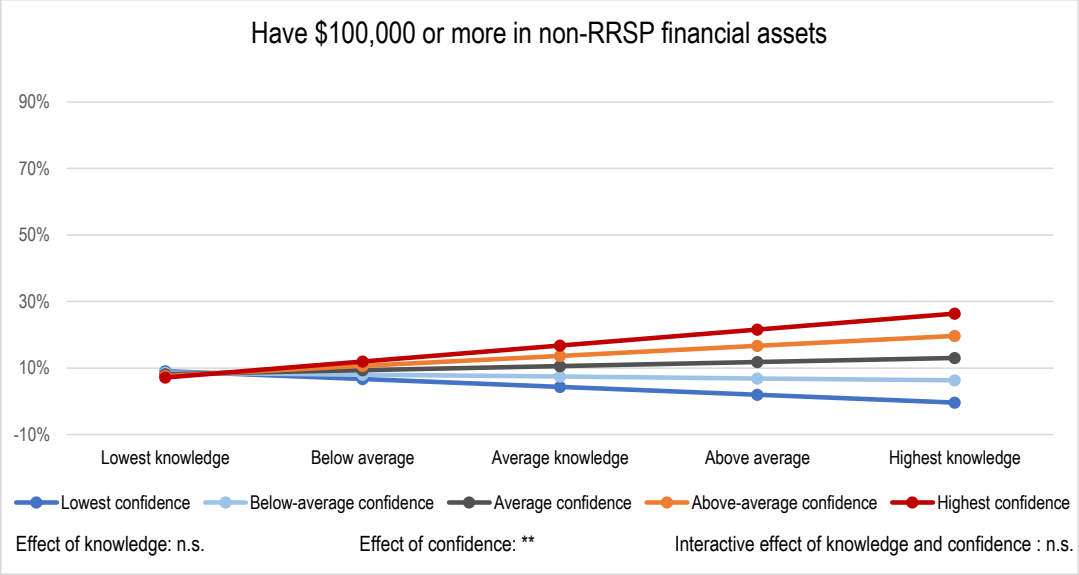


Note: If the effect of knowledge, confidence, or their interaction is statistically significant, stars are used to specify the level of significance. Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$). If the effect is not significant, it is denoted as "n.s." ($p > 0.1$).

In terms of assets, Figure 19 shows that those who are both highly knowledgeable and highly confident are most likely to have assets of $100,000 or more in either RRSP or non-RRSP vehicles. In this measure, the overconfident are doing no better than the underconfident — they are more likely to have $100,000+ assets in non-RRSP vehicles, but less likely to have similar levels of assets in RRSP's.

Figure 19 Retirement savings values





Note: If the effect of knowledge, confidence, or their interaction is statistically significant, stars are used to specify the level of significance. Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$). If the effect is not significant, it is denoted as "n.s." ($p > 0.1$).

Summary of findings

Overall in terms of retirement planning, the ***overconfident*** are more likely than the ***underconfident*** to say they know what they need to maintain their desired standard of living during retirement and to feel confident than they will have the income required to meet this standard of living. However,

when it comes to actual behaviour, there are few differences between these two groups. Relative to those with high knowledge and high confidence, both the *overconfident* and the *underconfident* are less likely to supplement workplace pensions with RRSP's, less likely to seek financial advice, and less likely to have retirement assets of $100,000 or more in either RRSP or non-RRSP vehicles. Table 3 provides a summary of the findings with respect to retirement planning and saving.

Table 3 Summary of findings – Retirement planning and saving

Variable	Effect of knowledge	Effect of confidence	Interactive effect
Good idea about retirement finances	***	***	
Confidence in retirement income		***	
Financially preparing for retirement	*	**	
Have RRSP	***		
Have workplace pension			
Paid advice for retirement planning	*		
$100,000+ in RRSP	***	*	
$100,000+ in non-RRSP assets		**	

Note: (1) Statistical significance at 10 per cent level is denoted with * ($p \leq 0.1$), 5 per cent with ** ($p \leq 0.05$), and 1 per cent with *** ($p \leq 0.01$).

Box 5Box 5 summarizes the policy implications of these findings.

Box 5 Implications – Retirement planning and saving

- Similar to general planning and saving, training programs aiming to enhance Canadians' ability to plan and save for their retirement need to improve both their understanding of financial concepts, and their belief in their own financial capability (and by implication, the habits underlying those beliefs).
- Overconfidence tends to give people the illusion that they are doing well in terms of planning and saving for their retirement. However, this may not be true when concrete financial preparations are examined. Underconfident individuals who may be prone to cognitive bias associated with procrastination and inertia are also not making adequate planning and saving to prepare for the later stages of their lives. This indicates that policy interventions aiming to enhance retirement planning and saving capability need to be designed with the contrasting financial literacy demands of these two groups in mind.

Overconfidence and underconfidence in planning and saving

The results from the multivariate analysis suggest that 1) those with high levels of knowledge but low levels of confidence (the underconfident) as well as 2) those with low levels of knowledge but high levels of confidence (the overconfident) are not doing well in terms of future planning and saving. The poor performance of the underconfident group is not surprising, as this is the group that is most likely to be prone to cognitive bias. Indeed, systematic decision-making errors resulting from a lack of self-control, procrastination, or status quo bias may undermine the effect of objective knowledge, leading to suboptimal planning and saving behaviour among underconfident individuals. The current findings are in line with existing empirical evidence and are consistent with the conceptual model from social cognitive theory.

The results of the overconfident group are also consistent with the behavioural finance literature, which shows that overconfident investors are more likely to use their own often erroneous judgment rather than seeking advice, and therefore more likely to suffer poor investment and savings returns. The combined presence of both high confidence and poor outcomes are not necessarily contradictory. The timeline associated with future planning and saving makes it unlikely that observations of past performance will be helpful. Habits developed in the context of ongoing day-to-day money management may be unrelated to the sophisticated cognitive processes that go into making effective plans for future financial needs. As a result, high self-efficacy built through continuing success in daily money management may actually be harmful for future money management, as high confidence in this case may trigger overconfidence-related bias.

These results illustrate the complex relationship that cognitive bias can have on financial decision-making. Different types of cognitive bias can affect behaviour and choice in various ways, and further studies conducted in a controlled laboratory environment may be necessary to identify the types of cognitive bias that are most influential in different domains of personal finance. Identifying the specific cognitive biases that may undermine planning and saving — as well as those that are behind poor day-to-day money and debt management — would be the first step to developing strategies to counter these biases and thus fostering greater financial well-being.

The report concludes with a summary of all findings, as well as a discussion of policy implications and research implications to help guide future work.

Summary of findings, and implications for future research and policy

1. **Many Canadians have low scores in either an objective assessment of financial knowledge, a subjective assessment of financial confidence, or both.**

   This suggests that there are substantial gaps to be filled in financial confidence as well as financial knowledge. Besides youth, other groups at risk for low knowledge, low confidence or both include women, those without a partner, those living in low-income households and those with lower levels of educational attainment.

   Designing strategies to address these gaps may in many cases require more than simple knowledge-based interventions. In particular, interventions need to account for the specific needs of those who lack confidence in managing their finances and the decision-making processes that underlie their low levels of confidence. The central importance of confidence in financial decision-making is summarized below.

2. **Financial confidence shapes behaviour and outcomes related to day-to-day money and debt management more than knowledge.**

   Financial confidence is a better predictor than knowledge of outcomes associated with day-to-day money and debt management. In fact, those with high levels of knowledge are likely to nonetheless experience relatively poor outcomes in areas such as meeting financial commitments, making bill payments, budgeting, and managing debt if they also have low levels of confidence. Furthermore, those who have relatively low levels of knowledge nevertheless achieve good outcomes in these areas if they have high levels of confidence.

   Financial confidence is also important in understanding many planning and saving outcomes. Those who are knowledgeable, but have low levels of confidence are likely to experience poor outcomes in areas such as investing, saving for major purchases (such as a new home), knowing how much they need for retirement, and saving adequate amounts for retirement.

   These findings suggest that having adequate understanding of financial concepts is important, but not sufficient to achieving desirable financial outcomes. Having confidence in one's ability to apply that knowledge when actually making decisions under real-life conditions is also crucial.

   Low financial confidence coupled with high knowledge may be an indicator of poor financial habits or practices despite "knowing better". The research literature suggests that poor financial practices may stem from a susceptibility to various kinds of cognitive biases in decision-making. An especially important bias in this context is likely to be ***present bias*** — i.e., acting contrary to one's intentions with regard to future costs and benefits because of a tendency, when it comes time to act, to give more weight to immediate costs and benefits. Other important departures from rational decision-making related to present bias include inertia and procrastination resulting from ***status quo bias***, and a tendency to weigh losses higher than equivalent gains (***myopic loss aversion***).

Further research is needed to identify the specific needs and biases in decision-making associated with low confidence, and to measure the extent to which such biases impact financial choices and behaviour. The currently available data do not allow for rigorous measurement or investigation of different kinds of cognitive bias.

Carefully designed studies in controlled laboratory settings would allow for ***direct measurement*** of present bias, status-quo bias, and myopic loss aversion, which in conjunction with measurement of indicators from the Canadian Financial Capability Survey would provide crucial insight into the psychological underpinnings of financial behaviour and outcomes. In addition, it would help us better describe the link between confidence and financial outcomes, shedding more light on why knowledgeable people with lower levels of confidence tend to fail where others with less knowledge but more confidence often succeed.

The ability to identify people with different kinds of needs (e.g., knowledge needs, needs linked to biased decision-making, or both) would help to better target interventions for those with low confidence. In addition, a better understanding of the habits, rules of thumb, and other practices (e.g., commitment devices) used by people with low levels of knowledge to build their confidence can help inform the design of interventions to counter biased decision-making among those who are less confident. Interventions that implement a learning-by-doing approach will help people to effectively learn and practice daily money management techniques that can be applied to future experiences.

3. Financial confidence may be undermined by poor knowledge in the context of planning and saving.

There are some indications from our results that in some cases poor financial outcomes may result from ***overconfidence***. In particular, those who are confident but not especially knowledgeable may often experience relatively poor planning and saving outcomes — for example, in areas such as investing, saving for major purchases (such as a new home), and saving adequate amounts for retirement.

One reason for these poor outcomes may be that those who are overconfident are less likely to seek professional financial advice, perhaps because they think they don't need it or don't know when to ask for it. The research literature suggests that overconfidence is often linked to biased-decision making in saving and investing because of the ways overconfident investors tend to distort information through the lens of prior beliefs, often attributing poor outcomes to bad luck and thus failing to see the need for change or advice.

In this context, confidence built through ongoing success in day-to-day money and debt management may actually undermine investing decisions, since practices developed in the context of managing current needs may be unrelated to the information processing demands associated with planning future financial needs. Simply targeting interventions around saving- and planning-specific information may not be enough, given that overconfident investors tend to discount information that appears to go counter to their beliefs.

Further research into the potentially detrimental effects of overconfidence on financial decision-making would require more detailed and direct measures of investing and saving

behaviour, and investigation into how the presentation and framing of new information may influence changes in behaviour, and thus inform the design the of targeted financial education interventions for this group.

In general, this research highlights the diversity of ways that confidence and knowledge may be linked with financial decision-making, and suggests that a one-size-fits-all approach to intervention is unlikely to reap dividends. Instead interventions need to be informed by a better understanding of the mechanisms through which confidence and knowledge gaps lead to poor outcomes, and tailored to the specific needs of those with different kinds of gaps.

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Appendix A: Behavioural indicators derived from CFCS

Table 4 Current money and debt management

Behaviour indicators	Survey questions and corresponding answers
On bill payment	**OE_Q14, OE_Q15, and OE_Q16**
Never late with bill payment	Answered "No" to all three questions
Have been behind on bill payment before	Answered "Yes" to at least one of the questions
Ability to keep up with bills and financial commitment	**OE_Q17**
No problem keeping up with bills	Keeping up with all bills and commitments without any problem
Struggle to keep up with bills	Keeping up with all bills and commitments, but it is sometimes a struggle; or Having real financial problems and falling behind with bills or credit commitments
Ability to stay within budget, among those who have a budget	**OE_Q12**
Usually or always stay within budget	Usually, or Always
Never or rarely within budget	Never, or Rarely
Have debts	**AD_Q11**
No debt other than mortgages or student loans	None of these debts or liabilities; or only Mortgages, and/or Student loans
Other debts or liabilities	Other answers
Use of pawnbroker, payday loans, or cheque-cashing services	**FM_Q04A, 04B, and 04C**
Yes, have used at least one of these services	Answers greater than 0 on any of these questions
No, never used these services	Answers of 0 on all three questions

Note: Unless otherwise stated, answers coded as “Don’t know” and “Refused” are excluded from the analysis.

Table 5 General planning and savings

Behaviour indicators	Survey questions and corresponding answers
Received investment income in the last 12 months	**IN_Q01C**
Yes	Yes
No	No
Number of insurance products	**FC_Q07**
0	Answered "None of the above"
1	Selected one of the products listed
2	Selected two
3	Selected three
4	Selected four
5	Selected five
6+	Selected six or more
Shop around for insurance products	**FC_Q08**
Yes	Answered "No, do not have all insurance policies with one company"
No	Answered "Yes"
Savings for future home	**ME_Q10**
Have saved more than 20% of the total price	21 to 50%
	51 to 75%
	76 to 100%
Saved 20% or less of the total price	Less than 5%
	5 to 10%
	11 to 20%

Note: Unless otherwise stated, answers coded as “Don’t know” and “Refused” are excluded from the analysis.

Table 6 Retirement planning and savings

Behaviour indicators	Survey questions and corresponding answers
Have a good idea how much money needed to maintain desired living standard during retirement	**RP_Q09**
No	No
Yes	Yes
Confident that household income will provide desired standard of living during retirement	**RP_Q08**
Confident	Fairly confident Very confident
Not confident	Not very confident Not at all confident
Financially preparing for retirement	**RP_Q01**
Yes	Yes
No	No
Have RRSP and other personal retirement savings plans	**RP_Q02**
Yes	Selected "Personal retirement savings plan benefits (RRSP, RSP)" as an answer
No	Did not select this option as a source of revenue in financial plan for retirement
Have workplace pension	**RP_Q02**
Yes	Selected "Occupational or workplace pension plan benefits" as an answer
No	Did not select this option as a source of revenue in financial plan for retirement
Obtained paid advice for retirement planning	**FC_Q01 & FC_Q03**
Yes	Indicated using advice for retirement planning in Q01, and indicated it is paid in Q03
No	Indicated using advice for retirement planning in Q01, but indicated it is unpaid in Q03
Current total value of RRSPs	**AD_Q04**
$100,000 or more	Answers in the groups of $100,000 and over
Less than $100,000	Any other answers less than $100,000
Current total value of non-RRSPs	**AD_Q08**
$100,000 or more	Answers in the group of $100,000 and over
Less than $100,000	Any other answers less than $100,000

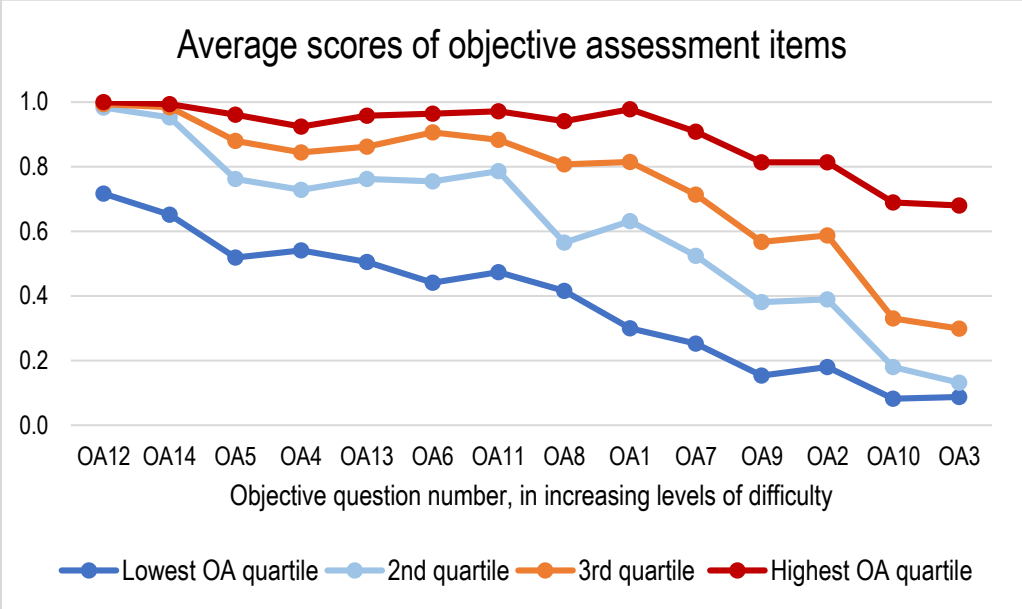
Note: Unless otherwise stated, answers coded as “Don’t know” and “Refused” are excluded from the analysis.

Appendix B: Validity of objective and subjective assessments

To analyze the ranking power of each individual survey items on the objective and subjective assessment modules, we calculate the mean score of each item for the entire population. Regarding the objective knowledge assessment, ranking the mean scores from highest to lowest sheds light on their levels of difficulty, as lower average scores tend to be associated with questions that are more difficult. Figure 20 organizes all the OA questions in increasing levels of difficulty.

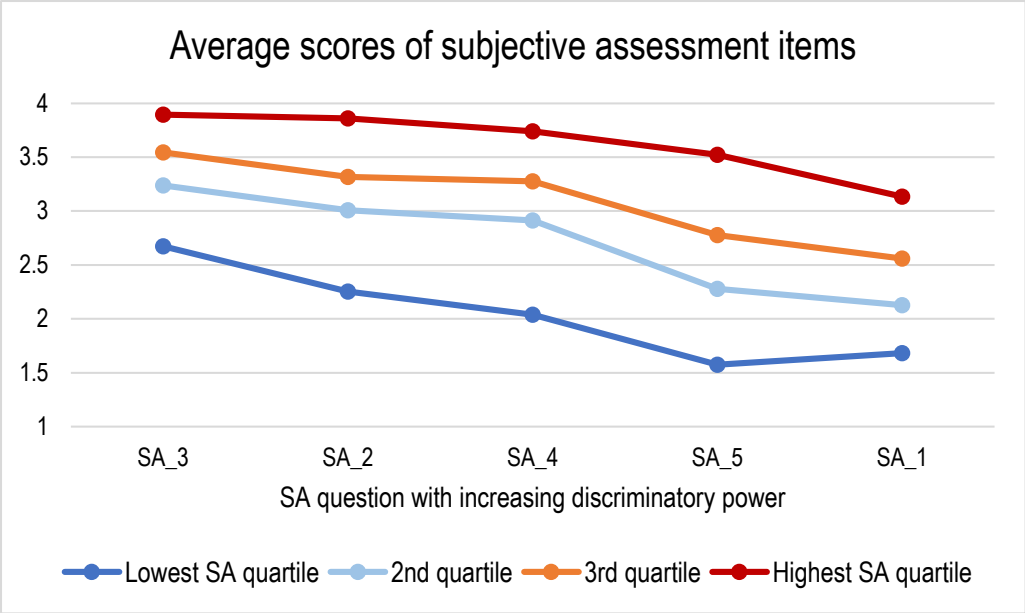
As shown in Figure 20, the average score for each question increases as we move up the knowledge quartile. Furthermore, a parallel trend emerges when all the mean scores within each of the four objective knowledge quartiles are connected. These trends demonstrate that people in higher knowledge quartiles tend to score higher on all individual objective questions. Therefore, altogether the questions in the OA module can separate respondents into appropriate knowledge quartiles. This implies that the objective knowledge indicator is suitable for our analysis.

Figure 20 Mean score of each OA question, by quartiles of objective financial knowledge



Similar mean score analysis is applied to each of the five subjective assessment items under consideration. Figure 21 illustrates these results. Those who are in the top confidence quartile score consistently higher on each of the five survey questions. The same parallel trends emerge, indicating that the confidence scale score is validly distinguishing low-confident people from those that are highly confident in their financial well-being.

Figure 21 Mean score of each SA question, by quartiles of subjective financial assessment



Appendix C: Results of descriptive analysis

Table 7 Distributions of relative confidence by demographic characteristics (%)

	Low knowledge		High knowledge		Chi-Square Test
	Low confidence	High confidence	Low confidence	High confidence	
Gender					
Male	27.8	20.5	23.7	28.7	56.1 ***
Female	35.0	21.6	24.0	19.4	(d.f.=3)
Age					
25-34	35.5	20.0	27.3	17.3	55.3 ***
35-44	30.0	16.7	26.2	27.1	(d.f.=9)
45-54	29.7	23.8	20.9	25.6	
55-64	33.1	19.9	21.8	25.2	
Marital status					
Do not have a partner	37.7	18.5	27.0	16.8	57.4 ***
Have a partner	29.4	21.0	22.9	26.8	(d.f.=6)
Missing values	34.5	0.8	57.4	7.3	
Household size					
Living alone	33.9	15.9	29.2	21.0	15.7 **
Two people	29.9	20.7	25.8	23.6	(d.f.=6)
Three to six people	32.5	20.7	22.6	24.2	
Presence of children of under 18 years old					
No	33.3	19.8	24.5	22.5	6.8 *
Yes	30.0	20.7	23.9	25.4	(d.f.=3)
Aboriginal status					
No	28.1	18.8	27.8	25.3	3.5
Yes	33.5	13.0	24.4	29.1	(d.f.=6)
Missing values	45.3	25.7	11.6	17.4	

	Low knowledge		High knowledge		Chi-Square Test
	Low confidence	High confidence	Low confidence	High confidence	
Education					
High school or less	38.6	25.3	20.0	16.1	134.3 ***
College, trade, vocational, or technical school	32.3	22.1	24.6	21.0	(d.f.=12)
Undergraduate degree	24.6	15.7	26.8	32.9	
Graduate degree	23.1	16.4	25.1	35.4	
Missing values	29.1	19.7	18.3	33.0	
Employment status					
Working	30.8	19.6	24.1	25.5	115.0 ***
Not working	37.1	25.5	24.5	12.9	(d.f.=6)
Retired, students, or unpaid household work	30.5	27.7	21.3	20.5	
Household income					
Less than $32,001	51.0	25.0	16.8	7.1	340.4 ***
$32,001 - $54,999	37.3	24.3	25.2	13.2	(d.f.=12)
$55,000 - $79,999	37.2	18.9	26.1	17.8	
$80,000 - $119,999	29.9	23.6	23.2	23.3	
$120,000 and over	20.0	13.4	26.0	40.6	

Note: Stars at the end of each row indicate that there is a significant difference in the corresponding characteristics between at least two of the knowledge-confidence groups. * denotes 10% significance level ($p \leq 0.1$), ** denotes 5% significance level ($p \leq 0.05$), and *** denotes 1% significance level ($p \leq 0.01$).

Appendix D: Relationship between objective and subjective assessment score

Table 8 Regression coefficients

Estimating the subjective assessment score – Full population (25-64)	
Objective assessment scores (knowledge)	0.11***
	(0.04)
Age (Reference: 25-34)	
35-44	0.24
	(0.28)
45-54	0.76***
	(0.27)
55-64	0.72***
	(0.27)
Aboriginal status (Reference: Aboriginal)	
Non-Aboriginal	0.11
	(0.33)
Personal income quintile	0.32***
	(0.08)
Gender (Reference: Male)	
Female	-0.45**
	(0.18)
Marital status (Reference: Without a partner)	
With partner	0.78***
	(0.25)
Household size (Reference: Living alone)	
2 people	0.23
	(0.30)
3 or more people	0.24
	(0.35)
Children under 18 in household (Reference: None)	
At least one	-0.29
	(0.26)
Highest level of education (Reference: High school or less)	
College, trade, technical, vocational school, with/without degree	-0.18
	(0.22)
Undergraduate degree/Post-secondary degree*	0.31
	(0.26)
Graduate degree	0.63*
	(0.37)

Estimating the subjective assessment score - Full population (25-64)	
Employment status (Reference: Not working)	
Working	-0.51
	(0.32)
Retired, students, or doing unpaid household work	0.24
	(0.37)
Constant	11.18***
	(0.57)
Observations	3,304
R-squared	0.09

Note: Robust standard errors are in parenthesis. Stars denote levels of statistical significance, with * denoting 10% significant level ($p \leq 0.1$), ** 5% level ($p \leq 0.05$), and *** 1% level ($p \leq 0.01$).

Appendix E: Multivariate results

Table 9 Daily money and debt management

	Never late on bill payment	No problem keeping up with bills	Have a budget, and always or usually stay within it	No debt other than mortgage or student loan	Have used pawnbroker, payday loan, or cheque-cashing services
Standardized OA scores (Knowledge)	0.00	-0.03*	0.00	-0.05***	-0.02*
	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)
Standardized SA scores (Confidence)	0.05***	0.12***	0.11***	0.05***	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Standardized OA x Standardized SA (Knowledge x Confidence)	0.01	0.01	-0.01	0.02	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age (Reference: 25-34)					
35-44	0.02	-0.08*	0.02	-0.09**	0.00
	(0.03)	(0.04)	(0.04)	(0.04)	(0.02)
45-54	0.02	-0.04	0.01	0.00	-0.03
	(0.03)	(0.04)	(0.04)	(0.04)	(0.02)
55-64	0.06**	0.08**	-0.05	0.05	-0.02
	(0.03)	(0.04)	(0.04)	(0.05)	(0.02)
Gender (Reference: Male)					
Female	0.02	0.00	0.09***	0.00	-0.02
	(0.02)	(0.03)	(0.03)	(0.03)	(0.01)
Marital status (Reference: Without a partner)					
With a partner	0.02	0.09**	0.01	-0.03	-0.02
	(0.03)	(0.04)	(0.04)	(0.04)	(0.02)
Household size (Reference: Living alone)					
2 people	-0.01	-0.02	-0.04	-0.06	-0.01
	(0.03)	(0.04)	(0.05)	(0.05)	(0.02)
3 or more people	-0.04	-0.03	-0.03	-0.01	0.01
	(0.04)	(0.05)	(0.06)	(0.06)	(0.03)
Children under 18 living in household (Reference: None)					
At least one	-0.04	-0.12***	0.00	-0.11**	0.03
	(0.03)	(0.04)	(0.05)	(0.04)	(0.02)

	Never late on bill payment	No problem keeping up with bills	Have a budget, and always or usually stay within it	No debt other than mortgage or student loan	Have used pawnbroker, payday loan, or cheque-cashing services
Educational attainment (Reference: High school or less)					
College, trade, vocational or technical school, with/without degree	0.00	0.02	0.10***	0.00	-0.02
	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
Undergraduate degree	0.04	0.08**	0.07	0.08*	-0.04**
	(0.03)	(0.04)	(0.04)	(0.04)	(0.02)
Graduate degree	0.05	0.03	-0.02	0.14**	-0.03
	(0.03)	(0.06)	(0.06)	(0.06)	(0.03)
Employment status (Reference: Not working)					
Working	0.00	0.05	0.04	-0.02	-0.05*
	(0.03)	(0.05)	(0.05)	(0.05)	(0.03)
Retired, students, or doing unpaid household work	0.03	0.11**	-0.02	0.08	-0.03
Aboriginal status (Reference: Aboriginal)					
Non-Aboriginal	0.07	0.11*	0.08	-0.02	0.01
	(0.05)	(0.06)	(0.06)	(0.06)	(0.03)
Household income quintile	0.03***	0.07***	-0.03***	-0.03**	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	1.68***	1.24***	1.39***	1.59***	1.15***
	(0.06)	(0.08)	(0.08)	(0.08)	(0.04)
Observations	3,297	3,284	3,282	3,274	3,289

Note: Robust standard errors are in parenthesis. Stars denote levels of statistical significance, with * denoting 10% significant level ($p \leq 0.1$), ** 5% level ($p \leq 0.05$), and *** 1% level ($p \leq 0.01$).

Table 10 General planning and savings

	Receive investment income	Number of insurance products	Shop around for insurance products	Saved more than 20% for future home
Standardized OA scores (Knowledge)	0.06***	0.13**	0.06***	0.06***
	(0.01)	(0.05)	(0.02)	(0.02)
Standardized SA scores (Confidence)	0.03***	0.06	-0.03*	0.05**
	(0.01)	(0.04)	(0.02)	(0.02)
Standardized OA x Standardized SA (Knowledge x Confidence)	0.02***	0.05	0.03*	0.06***
	(0.01)	(0.05)	(0.01)	(0.02)
Age (Reference: 25-34)				
35-44	-0.01	0.57***	0.04	0.06
	(0.03)	(0.13)	(0.04)	(0.04)
45-54	0.04	0.66***	0.03	0.25***
	(0.03)	(0.13)	(0.04)	(0.06)
55-64	0.09***	0.62***	0.00	0.41***
	(0.03)	(0.14)	(0.05)	(0.09)
Gender (Reference: Male)				
Female	-0.04*	0.10	0.06**	-0.01
	(0.02)	(0.08)	(0.03)	(0.04)
Marital status (Reference: Without a partner)				
With a partner	0.07***	0.79***	-0.09**	0.07*
	(0.02)	(0.12)	(0.04)	(0.04)
Household size (Reference: Living alone)				
2 people	-0.01	-0.07	0.09**	-0.06
	(0.03)	(0.14)	(0.05)	(0.06)
3 or more people	-0.06*	-0.20	0.06	-0.03
	(0.03)	(0.16)	(0.06)	(0.06)
Children under 18 living in household (Reference: None)				
At least one	-0.03	0.12	0.01	0.00
	(0.03)	(0.13)	(0.05)	(0.05)
Educational attainment (Reference: High school or less)				
College, trade, vocational or technical school, with/without degree	0.05**	0.24**	0.03	0.06
	(0.02)	(0.10)	(0.04)	(0.04)
Undergraduate degree	0.13***	0.13	0.09**	0.14**
	(0.03)	(0.12)	(0.04)	(0.06)
Graduate degree	0.21***	0.22	0.11*	0.01
	(0.05)	(0.16)	(0.06)	(0.06)

	Receive investment income	Number of insurance products	Shop around for insurance products	Saved more than 20% for future home
Employment status (Reference: Not working)				
Working	0.01	0.90***	0.13**	0.06
	(0.02)	(0.16)	(0.06)	(0.07)
Retired, students, or doing unpaid household work	0.00	0.37**	0.13*	0.18*
	(0.04)	(0.17)	(0.07)	(0.10)
Aboriginal status (Reference: Aboriginal)				
Non-Aboriginal	0.00	0.38**	0.12*	-0.16
	(0.05)	(0.18)	(0.07)	(0.16)
Household income quintile	0.02***	0.28***	0.03**	0.03
	(0.01)	(0.04)	(0.01)	(0.02)
Constant	1.01***	0.36	1.21***	1.00***
	(0.06)	(0.25)	(0.10)	(0.18)
Observations	3,290	3,298	2,981	516

Note: Robust standard errors are in parenthesis. Stars denote levels of statistical significance, with * denoting 10% significant level ($p \leq 0.1$), ** 5% level ($p \leq 0.05$), and *** 1% level ($p \leq 0.01$).

Table 11 Retirement planning and savings

	Retirement living standard expectation		Financially preparing for retirement	Retirement income source		Used paid advice for retirement planning	Financial asset values	
	Good idea how much is needed	Confidence in retirement income		RRSP	Workplace pension		RRSP	Non-RRSP
Standardized OA scores (Knowledge)	0.07***	0.02	0.03*	0.05***	-0.01	0.04*	0.10***	0.01
	(0.02)	(0.03)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Standardized SA scores (Confidence)	0.11***	0.19***	0.02**	0.02	-0.03	0.02	0.04*	0.03**
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Standardized OA x Standardized SA (Knowledge x Confidence)	0.00	0.02	-0.02	0.02	-0.03	0.04	0.02	0.02
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Age (Reference: 25-34)								
35-44	0.07*	-0.18***	0.09**	0.05	-0.03	0.14**	0.17***	0.11***
	(0.04)	(0.06)	(0.04)	(0.04)	(0.05)	(0.06)	(0.04)	(0.04)
45-54	0.13***	-0.13**	0.10***	0.12***	-0.02	0.17***	0.33***	0.25***
	(0.04)	(0.06)	(0.04)	(0.04)	(0.05)	(0.06)	(0.05)	(0.04)
55-64	0.12***	-0.10	0.17***	0.11***	-0.04	0.10**	0.45***	0.33***
	(0.04)	(0.07)	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)	(0.04)
Gender (Reference: Male)								
Female	-0.09***	-0.09**	0.01	0.02	0.06*	-0.05	-0.05	-0.07**
	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)	(0.03)
Marital status (Reference: Without a partner)								
With a partner	0.03	0.19***	0.07*	-0.01	0.11**	-0.06	0.10**	0.04
	(0.04)	(0.06)	(0.04)	(0.04)	(0.05)	(0.07)	(0.05)	(0.04)
Household size (Reference: Living alone)								
2 people	-0.02	-0.04	-0.03	0.01	-0.08	0.06	0.08	0.07
	(0.04)	(0.08)	(0.04)	(0.04)	(0.05)	(0.07)	(0.05)	(0.05)
3 or more people	0.03	0.05	-0.03	0.02	-0.20***	0.01	0.08	0.04
	(0.05)	(0.09)	(0.05)	(0.05)	(0.07)	(0.09)	(0.07)	(0.06)
Children under 18 living in household (Reference: None)								
At least one	-0.07	-0.11*	0.03	-0.02	0.04	0.06	-0.04	-0.03
	(0.04)	(0.06)	(0.04)	(0.04)	(0.05)	(0.06)	(0.05)	(0.05)

	Retirement living standard expectation		Financially preparing for retirement	Retirement income source		Used paid advice for retirement planning	Financial asset values	
	Good idea how much is needed	Confidence in retirement income		RRSP	Workplace pension		RRSP	Non-RRSP
Educational attainment (Reference: High school or less)								
College, trade, vocational or technical school, with/without degree	0.01	0.03	0.05*	0.09***	0.02	-0.05	-0.01	0.00
	(0.03)	(0.06)	(0.03)	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)
Undergraduate degree	0.06	0.19***	0.09**	0.12***	0.05	-0.02	0.03	0.04
	(0.04)	(0.07)	(0.03)	(0.04)	(0.05)	(0.06)	(0.05)	(0.04)
Graduate degree	0.06	0.16**	0.17***	0.12***	-0.04	0.10	0.15**	0.15**
	(0.06)	(0.08)	(0.04)	(0.05)	(0.07)	(0.09)	(0.07)	(0.07)
Employment status (Reference: Not working)								
Working	0.07*	0.20**	0.36***	0.06	0.19***	0.02	-0.01	0.02
	(0.04)	(0.10)	(0.04)	(0.07)	(0.07)	(0.08)	(0.06)	(0.06)
Retired, students, or doing unpaid household work	0.07	0.24	0.12	0.08	-0.19*	0.13	0.01	0.09
	(0.09)	(0.17)	(0.11)	(0.13)	(0.11)	(0.11)	(0.08)	(0.08)
Aboriginal status (Reference: Aboriginal)								
Non-Aboriginal	-0.06	-0.02	0.07	0.04	0.03	-0.14	0.12	-0.12
	(0.06)	(0.12)	(0.06)	(0.06)	(0.07)	(0.15)	(0.11)	(0.10)
Household income quintile	0.03**	0.11***	0.07***	0.05***	0.04**	0.03*	0.07***	0.07***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)
Constant	1.27***	2.19***	0.96***	1.32***	1.29***	1.07***	0.59***	0.88***
	(0.08)	(0.16)	(0.07)	(0.11)	(0.11)	(0.19)	(0.14)	(0.12)
Observations	2,887	2,923	2,981	2,345	2,345	741	1,704	1,675

Note: Robust standard errors are in parenthesis. Stars denote levels of statistical significance, with * denoting 10% significant level ($p \leq 0.1$), ** 5% level ($p \leq 0.05$), and *** 1% level ($p \leq 0.01$).

SRDC SRSA

Ottawa • Toronto • Vancouver

Ottawa

55 Murray Street, Suite 400
Ottawa, Ontario
K1N 5M3

55, rue Murray, bureau 400
Ottawa (Ontario)
K1N 5M3

Toronto

481 University Avenue, Suite 705
Toronto, Ontario
M5G 2E9

481, avenue University, bureau 705
Toronto (Ontario)
M5G 2E9

Vancouver

789 West Pender Street, Suite 440
Vancouver, British Columbia
V6C 1H2

789, rue Pender Ouest, bureau 440
Vancouver (Colombie-Britannique)
V6C 1H2

www.srdc.org 1 866 896 7732 info@srdc.org