Financial Literacy and the Timing of Tax-Preferred Savings Account Withdrawals[1]

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Abstract

Tax deductions on contributions to registered savings vehicles are a common policy tool used by governments in many industrialized countries to encourage people to save for retirement. However, these plans do not typically lock in funds, which means savers may also withdraw before retirement when their marginal tax rates are still high and forgo the tax benefit. In this paper, we investigate the extent to which pre-retirement savings withdrawals respond to changes in the net-of-tax benefit of withdrawing and whether such behavior depends on the saver's financial literacy. To that end, we link respondents of a nationally representative financial capability survey from Canada to over 15 years of administrative tax data. Our results show that the correlation between savings withdrawals and the effective marginal tax rate is negative for those with higher financial literacy, but much weaker and sometimes statistically insignificant for those with lower financial literacy. The findings suggest that financial literacy is an important determinant of the extent to which tax-deductible savings plans are used efficiently for retirement purposes.

Keywords: tax-preferred savings accounts, retirement savings, financial literacy

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1. Introduction

In most industrialized countries, tax incentives are the main tool used by governments to encourage people to save for their retirement. In Canada, Registered Retirement Savings Plans (RRSPs) allow taxpayers to make savings contributions with before-tax income and defer paying tax until these funds are withdrawn. Although this program is explicitly labeled as a retirement savings vehicle, funds do not lock in and there are no early withdrawal penalties imposed by the tax system. As a result, pre-retirement withdrawals are very common in practice. On average, one dollar is withdrawn each year for every five dollars contributed by working-aged savers (Giles and Maser 2004; Messacar 2017).[5]

The tax advantage offered by an RRSP is largely determined by the contributor's marginal effective tax rate (METR) at the time of contributing and when the withdrawals are made. Since RRSPs allow tax on the amounts saved to be deferred to a future period, the net value of a withdrawal is larger when it is made in a year when the METR is relatively low compared with other years. Due to tax progressivity, most taxpayers have higher tax rates during their working lives than in retirement, where income replacement rates are typically around 60 to 80 percent. However, the METRs that apply during retirement can sometimes be higher than the ones paid by individuals during their working lives (Shillington 2003; Laurin and Poshmann 2010). This is particularly true among low-income earners since public pensions and other transfer programs can lead to income replacement rates that exceed income from working years. Therefore, the optimal time to make an RRSP withdrawal can vary based on personal circumstances.

In a previous study analyzing RRSP withdrawals, Mawani and Paquette (2011) show that such behavior occurs frequently when tax rates are high. They find RRSPs are used for precautionary saving and income-smoothing purposes during times of financial hardship, such as after a job loss or divorce. The extent to which these tax mistakes are driven by low financial literacy is an unresolved empirical issue. The economic literature repeatedly underscores the critical role that

[5] This differs with Individual Retirement Accounts (IRAs) in the United States, which impose a 10 percent penalty on withdrawals made before the age of 59.5. In Canada, funds held in tax-deductible pension plans set up by employers lock in funds notwithstanding special cases of financial hardship.

financial literacy plays in financial decision-making and retirement readiness (Lusardi and Mitchell 2007; Boisclair et al. 2017). In this study, we investigate the extent to which savings withdrawals respond to changes in the net-of-tax benefit of withdrawing and whether financial literacy is a relevant determinant of such behavior.

To this end, we link a nationally-representative financial capability survey conducted by Canada's central statistics agency to over 15 years of administrative tax records. The survey asks numerous questions designed to measure respondents' knowledge of financial issues related to inflation, interest compounding, diversification and related financial market concepts. We use a linear regression model with fixed effects that estimates the effect of a per-unit change in the METR on RRSP withdrawals. Then, we assess whether there are differences in how withdrawals respond to changes in tax rates based on saver's level of financial literacy. Using this information-rich dataset, we provide an overall picture of withdrawal choices made by taxpayers, and we draw conclusions on the optimality of those retirement savings decisions.

This study provides an innovative perspective on the impact of tax incentives for retirement savings by incorporating financial literacy into the analysis. Our approach also stands apart in its use of panel data. More broadly, our study contributes to a growing literature on the various impacts of financial literacy. Many studies have shown that there is a positive relationship between financial literacy and better savings decisions. For example, Lusardi and Mitchell (2011) find that individuals with a high level of financial literacy are more likely to gather the information needed to prepare and successfully implement financial plans for their retirement.[6] More recently, a study by Boyer et al. (forthcoming) looks at the impact of financial literacy on the choice between the two types of tax-advantaged savings accounts in Canada: the RRSP and the TFSA. To our

[6] In recent years, a number of studies have examined the connection between financial literacy and retirement readiness and found a strong association between the two (Lusardi and Mitchell 2007, 2011, 2014; van Rooij et al. 2012; Mullock and Turcotte 2012; Lalime and Michaud 2014). For example, a study by Boisclair et al. (2017) found that individuals who correctly answered questions about interest rates, inflation and risk were 10% more likely to have saved for their retirement. Financial literacy has also been associated in the literature with greater wealth accumulation, partly because individuals with a better financial education are better informed about how the pension system works. They also tend to have more diversified retirement investments, pay lower investment fees, and earn a higher annual return (Chan and Stevens 2008; Hastings et al. 2011; Clark et al. 2017). Mullock and Turcotte (2012) estimate that the likelihood of knowing how much to save for reaching one's retirement goals increases by 30% when comparing the group with the lowest financial literacy (score lower than 50%) to the group with the highest (score greater than 85%), and that is among those who have retirement savings.

knowledge, our study is the first to establish a link between the interconnected issues of saving, tax incentives and financial literacy.

The rest of this study is structured as follows. The next section focuses on the economic theory pertaining to the optimal timing of an RRSP withdrawal. Section 3 presents the characteristics of the database used, along with relevant descriptive statistics, while section 4 describes the methodology used for the data analysis. Section 5 is dedicated to presenting the results. Lastly, we conclude with a brief discussion of the implications of our findings, plus avenues for future research.

2. Optimal Timing of RRSP Withdrawal

Tax-preferred savings accounts are defined based on whether the amount saved is subject to tax (Yoo and de Serres 2004). The RRSP is considered an EET (exempt-exempt-taxed) account because the amount contributed is tax exempt (E), the accumulated returns are as well (E), but the amount withdrawn is taxable (T). Annual contributions to the plan are limited by a ceiling; however, any unused contribution room accumulates and can be carried forward indefinitely. Unlike other retirement savings plans around the world, there are no penalties on RRSP withdrawals made before retirement. However, the amounts withdrawn cannot be re-contributed. In other words, the contribution room is reduced by the amount withdrawn. Therefore, withdrawing large amounts can significantly limit the contributor's capacity to save for retirement. Also, by withdrawing funds from an RRSP, the saver is forgoing the capitalization of the income from those tax-sheltered investments, which can significantly impact the value of the long-term savings.

In order to decide on the optimal time to withdraw from an RRSP, the individual must simultaneously factor in their current METR and what they anticipate their METR will be in future periods. That said, adequately estimating the METR involves a comprehensive understanding of the tax system and of the clawback rates of the assistance programs for which the taxpayer may be a recipient (Duclos et al. 2008; Blancquaert et al. 2017). It is repeatedly pointed out in the literature that a large proportion of taxpayers have only a partial understanding of the tax system. In fact, it has been shown that the progressive nature of the tax system is often misunderstood and that, as a

result, taxpayers underestimate the increase in marginal rates resulting from by a higher income (Gideon 2017; Rees-Jones and Taubinsky 2019). In addition, Feldman et al. (2016) find that taxpayers have difficulty interpreting an METR variation that results from a predictable change in eligibility for a tax credit, using the example of the Universal Child Care Benefit. Miller and Mumford (2015) show that taxpayers respond to a change in a tax measure in isolation and usually do not factor in the interactions with the other tax measures, even if they affect their METRs.

Numerous studies also address optimal choice between the two main types of tax-advantaged savings accounts, specifically in the Canadian context: the RRSP (EET-type) and the tax free savings account (TFSA; TEE-type). The problem of the optimal time for an RRSP withdrawal is very similar to that of choosing between these two types of savings vehicles because, in both cases, a rational decision must be made by comparing the METR at contribution time and at withdrawal time. In Quebec, the TFSA is chosen as a savings vehicle about 30% of the time; whereas it is predicted to be the optimal choice in about 70% of cases (Marchand, 2018). Boyer et al. (forthcoming) show that Canadians do not choose any better than if they had made a random decision when faced with choosing between an RRSP and a TFSA. That said, they find that a financial literacy intervention providing information about the tax implications of both types of accounts can increase both the understanding of how these accounts work and the quality of the savings decision.

Empirical evidence indicates that multiple Canadians use their RRSP as a contingency fund and make a withdrawal before retirement when a negative income shock occurs unexpectedly (Mawani and Paquette 2011). In a context where TEE-type tax-advantaged savings accounts (e.g., TFSA) are available, the economic agent can decide to make an RRSP withdrawal at a given period without affecting their ability to save for future periods. In fact, a portion of the amount withdrawn can simply be put into a TFSA so that the funds continue to generate a tax-sheltered compound interest return.

Given the tax treatment of RRSP withdrawals, individuals should opt to withdraw when their effective marginal rate is the lowest in order to minimize the tax that they pay. In the Appendix, we present a simple 2 period economic model which shows that the optimal timing involves minimizing the effective marginal tax rate at the time of withdrawing. This prediction leads us to

conclude that only the marginal effective tax rates matter in deciding the optimal time to make an RRSP withdrawal and that preferences should play any role. Depending on the difference between the METRs in the first and second periods, making a withdrawal at the wrong time can have considerable relative costs. Low-income households are especially vulnerable to this type of error and, depending on the size of the withdrawal, the relative cost can considerably impact their personal finances. This result is consistent with what is found by Boyer et al. (forthcoming) and Grenier (2019) in the context of choosing between an RRSP and a TFSA.

3. Data

3.1 Data sources

Administrative data typically doe not contain information on financial literacy. Similarly, survey data rarely contain longitudinal data on contributions and withdrawals to tax-preferred savings accounts. For this project, we have created the Financial Capability, Employment and Income Database (FCEID), which contains the Canadian Financial Capability Survey (CFCS) matched with T1 personal income tax records (tax forms). Administered by Statistics Canada in 2014, the CFCS collected information about Canadians' knowledge and skills regarding financial decision-making and about the respondents' financial planning behaviours. The purpose of the survey is to assess Canadians' financial situation and plans for the future along with how well they understand the financial services available to them[7]. The longitudinal data from the income tax return forms are provided by the central tax authority, Canada Revenue Agency, for the years 2000 to 2016. The data contain a wide range of information on income, tax credits, deductions, retirement savings, and taxes payable by the filers. A unique, anonymous identifier for each person is used for matching these annual data with the individual's responses in the 2014 CFCS. This linkage procedure was done by a methodology team at Statistics Canada, not by ourselves, to further protect the confidentiality of the survey respondents.

[7] The exact list of questions used for this study can be consulted under the "Objective personal assessment" section of the following link:
https://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=assembleInstr&a=1&&lang=en&Item_Id=201522.

3.2 Sampling and data linkage

The CFCS is a sample survey with a cross-sectional design whose target population is all Canadians aged 18 and older residing in one of the country's 10 provinces. The database contains analytical weights that enable the data to reflect the demographic composition of the overall Canadian population. The sample consists of a total of 6,685 individuals questioned in the context of the survey, 6,229 of whom were then able to be matched with their annual tax data. As such, a total of 105,893 observations are entered into the panel from 2000 to 2016. The match rate is high. We have checked that excluded respondents are not statistically different from those retained in the matched file. While respondents are slightly older, we cannot report meaningful differences across the two groups.[8] Some restrictions are placed on the sample for the purpose of obtaining estimates representative of the population of interest. We restrict the sample to people who were between the ages of 30 and 70 when they participated in the CFCS in 2014 because we consider this to be the age group most likely to contribute to an RRSP. We keep tax records between the ages of 18 and 70 for each year observed. The final sample consist of a total of 5,994 respondents and 69,228 tax-year observations between the years 2000 and 2016.

3.3 Measuring financial literacy

Respondents in the CFCS were asked a set of 14 questions for the purpose of objectively assessing their knowledge level of financial concepts. The questions dealt with such concept as inflation, knowledge of various types of investment products, the stock market, interest rates, and a number of other topics pertaining to personal finance.[9] In what follows, we use the number of correct answers to those questions as an index of the respondents' financial literacy level. The scores are grouped into two categories based on the median observed in the sample, either low (score of 9/14 or less) or high (score of 10/14 or more).[10] Overall, 3,484 individuals fall into the low financial literacy category versus 2,296 individuals in the high financial literacy category. The distribution of scores is shown in Figure 1.

[8] The age difference is likely the results of students not having to file taxes while studying and therefore not having tax records in the years preceding the CFCS.
[9] The exact list of questions can be consulted under the "Objective personal assessment" section of the following link: https://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=assembleInstr&a=1&&lang=en&Item_Id=201522.
[10] Generally, we have found our results to be relatively insensitive to the cut-off used for the two groups.

Financial literacy varies substantially across demographic and economic dimensions. Table 1 presents a set of descriptive statistics for each financial literacy group as well as the t-and-p-value statistics of a Student's t-test on the difference between the averages of the two groups. All the differences in averages are statistically significant at the 99% confidence level with one exception, which confirms that the differences between the two financial literacy groups are indeed significant.

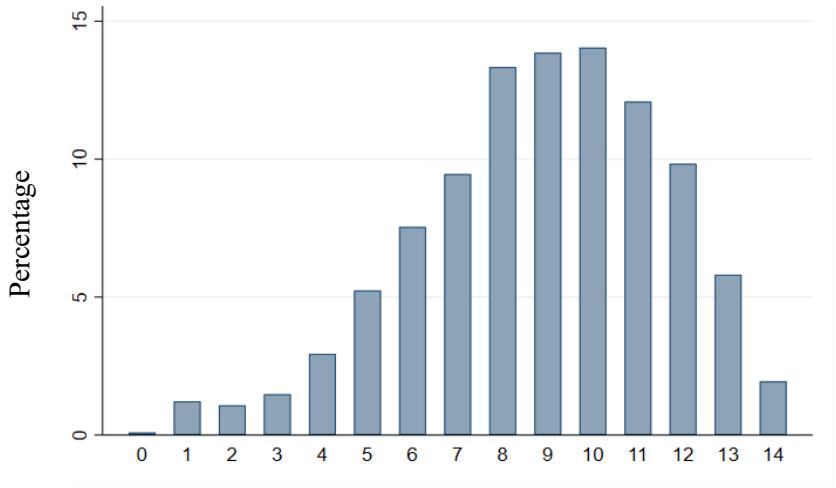

Figure 1 – Distribution of financial literacy score on 14 questions: The figure shows the percentage of the sample that obtained each number of good answers. The individuals who did not answer any questions are counted as missing.

By comparing the averages of the two groups presented in Table 1, we first see that the low financial literacy group consists of a larger proportion of women and individuals with a marital status other than married. Also, the averages of the education and income variables confirm that the group with better financial literacy generally reaches higher education and income levels. In particular, nearly double the proportion of the high financial literacy group completed a bachelor's degree, and they earn an employment income roughly $15,000 higher on average. In addition, the average interest and dividend income for this group is nearly triple that of the low financial literacy group. Table 1 also shows us that the proportion of the low financial literacy group who made an RRSP withdrawal at least once between 2000 and 2016 is 43%, versus an average of 48% for the high financial literacy group. The average amounts of RRSP withdrawals are also significantly higher for the high financial literacy group.

		Mean		t test	p value
		Low FL	High FL		
Demographics					
	Age	44.58	44.3	10	0
	Female (%)	55.65%	46.34%	20	0
	Married (%)	52.32%	60.44%	-1866	0
Education					0
	High School Not Completed	15.28%	6.75%	51	0
	High School Diploma	22.56%	14.45%	15	0
	Some Postsecondary or University Certificate	44.19%	42.93%	2	0.06
	Bachelor Degree	12.83%	23.09%	-38	0
	Higher than Bachelor Degree	5.14%	12.78%	-35	0
Total Income					
	Employment Income	28,020	43,428	-39	0
	Self Employment Income	1,011	3,279	-13	0
	Investment/Dividend Income	1,069	2,969	-11	0
	Unemployment Insurance Income	762	564	17	0
Sources of Income	Employment Income	76.99%	80.68%	-16	0
	Self Employment Income	7.87%	12.32%	-16	0
	Investment/Dividend Income	25.87%	39.22%	-35	0
	Unemployment Insurance Income	13.6%	9.35%	20	0
RRSP Withdrawals	At Least One Withdrawal Between 2000-2016	43.1%	48.02%	-15	0
	Amount Withdrawn	387.42	504.6293	-7	0
METR		20.42%	26.278%	-44	0

Table 1 – Descriptive statistics by level of financial literacy: Individuals with a score of 9/14 or less are in the low FL group, and those who scored 10/14 or more are in the high FL group. Income figures are in nominal dollars.

3.4 Who withdraws more from an RRSP?

Table 2 gives descriptive statistics about RRSP withdrawals for three different subsamples. First, when factoring in all the observations in our database, a negative relationship emerges between RRSP withdrawals and total income quartiles. In fact, taxpayers in the first income quartile are the ones who withdraw the most, on average, while the last quartile withdraws the least. When we eliminate from the sample all individuals who made no withdrawals between 2000 and 2016, we see larger withdrawals on average for the high financial literacy group compared with the other group. We can also see that the relationship between RRSP withdrawals and total income quartiles

appears to be U shaped. The average amount withdrawn decreases with income as far as the third quartile, and then rises at the fourth quartile.

We also produce the same statistics for the group with positive RRSP withdrawals. This enables us to, among other things, isolate the impact of the size of the amounts withdrawn on the averages given above. We see that the difference in average amount withdrawn between the high and low financial literacy groups persist. Also interesting to note is that the proportion of observations of non-zero withdrawals among the individuals who had made at least one withdrawal is very similar between the two groups, namely 20.99% and 21.16% respectively for those with low and high financial literacy. The relationship between income quartiles and withdrawals is still a quadratic trend, with the first quartile's average amount withdrawn being significantly higher than that of the other quartiles.

Descriptive Statistics on RRSP Withdrawals

	Mean	Median	90%	95%	Nb. obs.
All Observations					
Financial Literacy Group					
Low	387.42	0	0	1,333	36,395
High	504.63	0	11	1,646	29,038
Income Quartile					
17,752$ or less	504.12	0	0	1,333	17,307
17,754$ to 35,460$	406.18	0	0	1,560	17,308
35,461$ to 57,939$	399.58	0	128	1,657	17,306
57,940$ or more	392.34	0	0	1,300	17,307
Total	427.57	0	0	1,333	69,228
At Least One RRSP Withdrawal Between 2000-2016					
Financial Literacy Group					
Low	899.88	0	1,988	5,181	15,479
High	1,053.27	0	1,898	6,652	14,044
Income Quartile					
17,752$ or less	1,573.76	0	4,999	10,250	5,757
17,754$ to 35,460$	873.80	0	2,040	5,555	8,052
35,461$ to 57,939$	746.57	0	1,394	5,000	8,839
57,940$ or more	839.47	0	1,333	4,973	8,483
Total	964.35	0	1,903	5,829	31,131
Observations with non-zero RRSP Withdrawals					

Financial Literacy Group					
Low	4,246.24	1,666	10,786	18,192	3,25
High	5,009.10	1,600	14,847	20,000	2,972
Income Quartile					
17,752$ or less	6,827.88	3,467	19,706	26,666	1,365
17,754$ to 35,460$	4,532.53	2,298	11,440	16,455	1,625
35,461$ to 57,939$	3,527.13	1,333	9,686	14,267	1,858
57,940$ or more	4,088.89	1,333	11,890	17,918	1,679
Total	4,616.51	1,666	13,152	19,515	6,527

Table 2– Descriptive statistics on RRSP withdrawals: The low and high financial literacy groups respectively scored 9/14 or less and 10/14 or more. Income quartiles are defined on the basis of total income, from which the RRSP withdrawal made in the year is subtracted, if any.

3.5 Estimating marginal effective tax rates

We estimate for each respondent and tax year, the annual marginal effective tax rate (METR) using the Canadian Tax and Credit Simulator (CTaCS),[11] which contains a large number of Canadian tax rules and parameters from the years 1962 to 2016. The METR calculated from the estimates provided by CTaCS account for the federal and provincial taxes, but also the impact of tax credits, deductions and benefits on disposable income. To compute the METR we simulate a change in RRSP withdrawals and observe the effect on after tax income. We first estimate disposable income π_n based on the vector $Y_{i,t}$, i.e., all annual tax variables entered into CTaCS, and the variable w, i.e., RRSP withdrawals, which is set at zero in the baseline. We then repeat the exercise, changing the value from w to $1,000 for all observations. With these two disposable income estimates, we are now able to calculate the METR per year t for each individual i, which is defined as follows:

$$METR_{i,t} = 1 - \frac{\pi_n(Y_{i,t}, w) - \pi_n(Y_{i,t}, 0)}{w}$$

[11] See Milligan (2016). A comprehensive list of the CTaCS input and output variables is described in the user guide at the following link: https://faculty.arts.ubc.ca/kmilligan/ctacs/. Among the input variables are sociodemographic variables such as sex, age and marital status, plus financial variables such as income from various sources and several expenses and contributions that can qualify the taxpayer for certain tax deductions or credits. Based on that, the simulator puts out such things as total tax payable, as well as the main government transfers and federal and provincial refundable and non-refundable credits.

4. Methodology

4.1 Linear regression models with fixed effects

The theoretical prediction is that withdrawals should correlated negatively with the METR at the respondent level over time: i.e. respondents should time withdrawals when marginal tax rates are low. We implement a fixed effect regression framework that exploits this idea. If an individual makes a withdrawal during a period when their METR is above the average, they are potentially encurring a loss from a financial perspective. By estimating this regression separately by financial literacy group, we have a direct test of whether the timing of widthdrawals is more tax efficient among those with higher financial literacy. Precisely, we postulate the following fixed effect linear regression:

$$R_{i,t} = \alpha METR_{i,t} + X'_{i,t}\beta + \mu_i + \varepsilon_{i,t} \quad (1)$$

where RRSP withdrawals $R_{i,t}$, the marginal effective tax rate $METR_{i,t}$ and a set of explanatory variables $X_{i,t}$ are observed for each individual i over several periods t and an unobservable term μ_i captures the time-invariant characteristics for each individual i. Lastly, the term $\varepsilon_{i,t}$ represents the residuals. Standard errors are clustered at the respondent level. We first produce an initial specification of our model where our vector of explanatory variables $X_{i,t}$ contains only demographic variables. We include a dummy variable for each age level between the ages of 18 and 70 and a dummy variable for each marital status. This specification enables us to measure the impact of the METR on the amount withdrawn from the RRSP without controlling for income. We than add two explanatory variables to the vector $X_{i,t}$, namely $y_{i,t}$ and $y_{i,t}^2$, which represent, respectively, total income[12] and total income squared. The quadratic term is included to enable a non-linear relationship between our dependent variable and total income. Lastly, the model's third specification contains a more varied set of controls for income including employment income, self-employment income, investment and dividend income, employment insurance, and social assistance. We also include a quadratic term for the first three income types mentioned because they can reach fairly large amounts and, therefore, their relationship to RRSP withdrawals could

[12] Total income is the sum of all sources of income before taxes, as defined by the Canada Revenue Agency (line 15000 of the income tax return), minus the income from an RRSP withdrawal.

be non-linear. For each of the specifications, we estimate the coefficients twice: once for each financial literacy group.

Then we develop a fully interactive model in order to determine if the difference between the coefficients obtained for the high and low financial literacy groups is statistically significant. This model simply involves adding the interaction terms between the high financial literacy dummy variable FL_i and the set of explanatory variables to the previous regression. This gives us the following regression:

$$R_{i,t} = \alpha_0 METR_{i,t} + \alpha_1 METR_{i,t} \cdot FL_i + X'_{i,t}\beta_0 + X'_{i,t}\beta_1 \cdot FL_i + \mu_i + \varepsilon_{i,t} \qquad (2)$$

In this model, the coefficients α_0 and β_0 of equation 2 are identical to the coefficients α and β of equation 1 estimated for the low financial literacy group. The coefficients α_1 and β_1 correspond to the difference between the coefficients derived from model 1 for the high financial literacy group and the low financial literacy group. In other words, model 2 captures the additional impact of having high financial literacy on all the explanatory variables. Specifically, using our estimate of the coefficient α_1, we will be able to determine whether individuals with high financial literacy place greater importance on their METR when deciding how much to withdraw from their RRSP. In fact, if that is true, the coefficient α_1 is expected to be negative, meaning that a marginal increase in the METR would result in a greater reduction in the amount withdrawn from the RRSP in the high financial literacy group.

4.2 Robustness tests

Our first robustness test aims to estimate the impact of a change in the METR at the extensive margin, i.e. the decision to withdraw funds from RRSPs rather than the total amount. We change our RRSP withdrawals variable $R_{i,t}$ into a dichotomous variable $D_{i,t}$ that takes the value 1 if the individual made a withdrawal during the observed period or 0 if not. We then estimate the following linear probability model with fixed effects:

$$D_{i,t} = \alpha_0 METR_{i,t} + \alpha_1 METR_{i,t} \cdot FL_i + X'_{i,t}\beta_0 + X'_{i,t}\beta_1 \cdot FL_i + \mu_i + \varepsilon_{i,t} \qquad (3)$$

An addition, a significant proportion of individuals in the sample do not make any withdrawals in all the years observed. Although our database doesn't contain any variable indicating whether the individual has an RRSP, we observe at least one withdrawal between the years 2000 and 2016 for roughly 48% of the high financial literacy group versus roughly 43% for the low financial literacy group (see Table 1). In the likely event that individuals with low financial literacy account for a larger proportion of the group without RRSPs, the bias towards zero would be stronger for the coefficients pertaining to this subsample. This could artificially increase the difference between the coefficients for the high and low financial literacy groups. We therefore perform a second robustness test for the purpose of checking the validity of our estimates in the absence of this bias. To do so, we remove from our sample all individuals who made no withdrawals between 2000 and 2016, and we estimate model (2) from that subsample.

Lastly, we seek to determine whether the results are robust across various demographic groups. To do so, we divide our sample by sex, province and mother tongue, and we estimate model 2 on each subsample. We estimate the model only for the two provinces with the most observations, Quebec and Ontario. By limiting the sample to the observations of certain groups, we can check whether the results obtained hold up and how they differ by group.

5. Results

5.1 Main Regression Results

To start, we present the estimates separately for each financial literacy groups (equation 2) in Table 3. For each subsample, the first column gives the estimates with explanatory variables only for age and marital status; the second column adds control variables for total income; and the third column includes explanatory variables for various types of income.

We find that the METR has a significant negative effect on RRSP withdrawals for both financial literacy groups and this effect persists with the addition of various control variables. In other words, the null hypothesis that a change in the METR has no impact on RRSP withdrawals is rejected with a 1% confidence level for individuals with low and high financial literacy. In the specification with only demographics controls, the METR elasticities of -0.96 and -1.57 were

obtained for the low and high financial literacy groups respectively.[13] This implies that a 10% increase in the METR reduces the amount withdrawn from the RRSP by 9.6% on average for the low financial literacy group and 15.7% on average for the high financial literacy group. When comparing the two subsamples, we also notice that the coefficient for the METR variable is a larger in absolute value for those with high financial literacy. This result is also consistent with our original assumption that a high level of financial literacy makes people more responsive to their METR when deciding how much to withdraw from their RRSP. In the next section, we will test whether this difference is statistically significant.

Fixed Effect Regression on RRSP Withdrawals						
	Low Financial Literacy			High Financial Literacy		
	(1)	(2)	(3)	(1)	(2)	(3)
METR	-18.258***	-9.911***	-7.119***	-30.096***	-27.249***	-23.108***
	(2.484)	(2.101)	(2.085)	(3.624)	(3.560)	(3.489)
Income variables						
Total income		-115.007***			-24.9556***	
		(23.031)			(9.001)	
Total income ^2		1.339e-04***			3.139e-6***	
		(3.153e-05)			(1.259e-6)	
Employment income			-135.532***			-54.879***
			(21.648)			(12.819)
Employment income ^2			1.77e-04**			1.54e-05***
			(7.67e-05)			(3.97e-6)
Investment income			-110.757***			-47.197***
			(30.997)			(17.992)
Investment income ^2			1.25e-04***			5.18e-05***
			(3.66e-05)			(1.99e-05)
Net self employment income			-260.858***			-151.333***
			(69.237)			(31.623)
Net self employment income ^2			3.06e-04***			2.92e-04***
			(8.28e-05)			(7.12e-05)
Unemployment insurance income			-168.589***			13.741
			(54.152)			(75.505)
Social assistance income			-287.090***			-401.917***
			(60.743)			(89.873)
Marital Status						
Common law	88.128	69.113	54.968	-113.105	-120.25	-112.588
	(81.828)	(82.457)	(82.671)	(91.805)	(92.035)	(91.857)
Widow	522.61**	531.61**	444.222**	267.834	265.489	242.621
	(224.454)	(223.22)	(222.405)	(299.416)	(299.05)	(298.269)

[13] For the low FL group, the coefficient is -18.258, while the average of the METRs and withdrawals is 20.42 and 387.42, respectively (Table 1). For the high FL group, the coefficient is -30.096, and the average of the METRs and withdrawals is 26.28 and 504.63. As a result, the averaged elasticities are -0.96 and -1.57.

Divorced	303.288* (170.506)	300.464* (170.936)	289.933* (170.953)	-81.62 (166.553)	-87.799 (166.414)	-78.428 (166.329)
Separated	205.07* (115.41)	197.471* (116.234)	187.614 (115.384)	275.5* (147.862)	268.607* (148.493)	278.803* (149.073)
Single	166.515** (75.634)	131.202* (76.658)	114.598 (77.604)	144.682 (119.518)	124.667 (119.765)	130.261 (119.989)
(Married)	-	-	-	-	-	-
Age Fixed Effect	Included	Included	Included	Included	Included	Included
Intercept	333.698*** (88.513)	196.076*** (88.76)	157.415** (88.132)	711.813*** (127.64)	636.784*** (128.287)	560.015*** (127.276)
Number of observations	36,244	36,178	36,244	28,907	28,818	28,907

Table 3 – Fixed effect regression on RRSP withdrawals: Coefficients are estimated by OLS. Robust standard errors are shown in parentheses. The EMTR variable is expressed as a percentage multiplied by 100. Income variables are divided by 10 000. Total income refers to all sources of income, from which RRSP withdrawals are subtracted. Investment income is the combined dividend and interest income. A dummy variable is included for each age level between 18 and 70, but is not presented above. ***, **, * denote statistical significances at the 1, 5 et 10 percent levels, respectively.

By including only explanatory sociodemographic variables, we see that the METR coefficient is larger than the two specifications with income controls, especially for the subsample with low financial literacy. Without controlling for income, the METR coefficient partially captures the impact of a change in income on RRSP withdrawals due to the positive covariance between these two variables. Therefore, this bias accentuates the negative value of the METR coefficient. When adding two control variables for total income in the second column, the coefficient associated with the METR decreases by almost half for the low financial literacy group; whereas a similar effect of much smaller magnitude is seen for the high financial literacy group. In fact, this produces METR elasticities of -0.52 and -1.42 for the low and high financial literacy groups, respectively. In the third model, we replace the two control terms for total income with a number of explanatory variables for taxpayers' main sources of income. This specifically allows each type of income to have a distinct impact on RRSP withdrawals. All the coefficients associated with these explanatory variables are statistically significant at the 1% threshold, with one exception. For the low financial literacy group, an elasticity of -0.375 is estimated while the elasticity is -1.2 for the group with high financial literacy. These estimates are significant at the 1% threshold.

In Figure 2, we plot age dummies for both financial literacy groups at each distinct age between the ages of 26 and 70. These coefficients represent the marginal effect on RRSP withdrawals at each age level, using age 25 as the point of reference. All the coefficients presented in the chart are statistically significant at the 1% threshold. We see that the two trends are relatively similar

until the individuals reach age 60. Withdrawals are more frequent for the high financial literacy group before the age of 65. At age 65, Canadians become eligible for the Guaranteed Income Supplement, a means-tested benefit, which substantially increases marginal effective tax rates for low earnings. One possibility is that respondents with higher financial literacy are better at avoiding withdrawing at those ages.

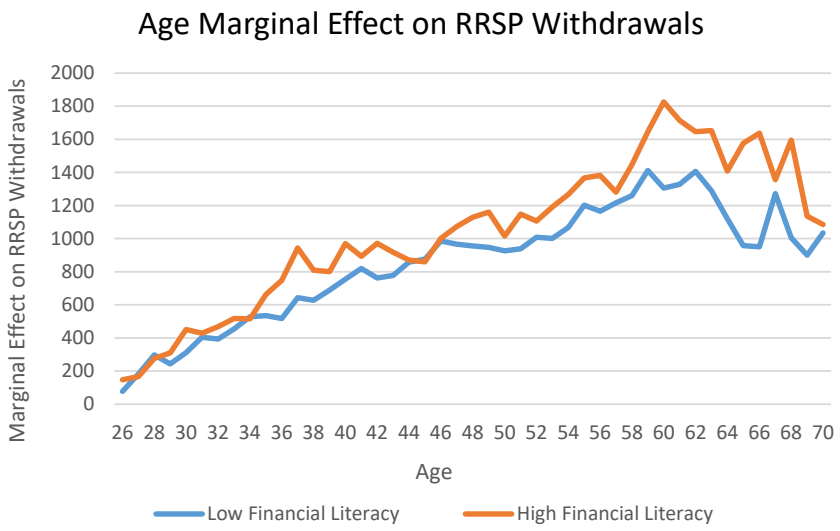

Figure 2 – Age marginal effect on RRSP withdrawals: The graph above shows the trend of the coefficients estimated by OLS for each age between 26 and 70 years old, with 25 years old as a reference point. The estimates come from the 3rd specification of model 1.

5.2 Fully interacted linear model with fixed effects

We also estimate a fully interacted model to test the difference in the effect of METR on withdrawals between the two financial literacy groups. Results are presented in Table 4. The interaction term is always negative and statistically significant at the 1% confidence level. In other words, this means that individuals with high financial literacy are significantly more responsive to a change in the METR when they have to decide how much to withdraw from their RRSP each period.

Fully Interacted Regression with Fixed Effects on RRSP Withdrawals			
	(1)	(2)	(3)

METR * FL	-11.838*** (4.393)	-17.338*** (4.133)	-15.989*** (4.064)
Income variables * FL			
Total income * FL		90.051*** (24.726)	
Total income ^2 * FL		-1.31e-04*** (3.16e-05)	
Employment income * FL			80.653*** (25.157)
Employment income ^2 * FL			-1.62e-04** (7.68e-05)
Investment income * FL			63.560* (35.838)
Investment income ^2 * FL			-7.3e-05* (4.17e-05)
Net self employment income * FL			109.525 (76.114)
Net self employment income ^2 * FL			-1.38e-05 (1.09e-04)
Unemployment insurance income * FL			182.330** (92.899)
Social assistance income * FL			-114.827 (108.455)
Intercept	335.001*** (90.564)	260.472*** (90.834)	221.502** (90.762)
Number of observations	65,131	65,131	65,131

Table 4 – Fully interacted regression with fixed effects on RRSP withdrawals: Coefficients are estimated by OLS. Robust standard deviations are shown in parentheses. The EMTR variable is expressed as a percentage multiplied by 100. Income variables are divided by 10 000. Total income refers to all sources of income, from which RRSP withdrawals are subtracted. Investment income is the combined dividend and interest income. Interaction terms of marital status and age and all non interacted variables are not presented. ***, **, * denote statistical significances at the 1, 5 et 10 percent levels, respectively.

This result is consistent with the hypothesis that taxpayers with low financial literacy are not as informed about how the tax system works.

5.3 Robustness testing

5.3.1 Model with a dichotomous dependent variable

Assume that the decision-making process for making an RRSP withdrawal occurs in two stages. First, the individual decides whether to make an RRSP withdrawal during the period. Then they decide how much to withdraw, if applicable. Our approach so far factored in these two decisions together. However, the METR may have a separate marginal effect on each of these decisions.

The first three columns in Table 5 presents regression estimates using as a dependent variable a dichotomous variable taking the value of 1 if a withdrawal was made during the period, and 0 if not. First, we see that the difference between the marginal effects of the METR of the high and low financial literacy groups captured by the coefficient of the variable METR · FL is negative and statistically significant at the 1% threshold in the second and third columns. In addition, the coefficient of the METR variable is not statistically significant when adding the diverse set of controls for income in the third column. In other words, we are unable to reject the null hypothesis that the marginal effect of the METR on the decision to withdraw from the RRSP is zero for the low financial literacy group. This implies that the individuals in this group may not factor their METR into the decision about whether to make an RRSP withdrawal during the period.

By adding controls for income, we see that the difference in marginal effect of the METR between the two groups expands, suggesting that the impact of income on the decision to withdraw is greater in the low financial literacy group. In fact, the coefficients of the income terms have a negative non-linear marginal effect that is statistically greater when financial literacy is low in the case of the total income and employment income variables.

Overall, the results estimated by this model show trends similar to those obtained using our basic models. The high financial literacy group places more importance on their METR not only when deciding how much to withdraw from their RRSP, but also when deciding whether to withdraw in the year observed.

5.3.2 Model limited to individuals who made at least one RRSP withdrawal

The second robustness test involves estimating the model with interactions on a limited sample consisting only of individuals who made at least one RRSP withdrawal between 2000 and 2016. The objective of this test is to check whether the conclusions we drew using the basic models still hold when excluding individuals who make no withdrawals during the observed periods and, therefore, for whom the estimated marginal effect of the METR is inevitably zero. The last three columns of Table 5 give the results of that model.

Again, we obtain a coefficient for the interaction term METR · FL that is negative and statistically significant at the 10% threshold in the first two columns and at the 5% threshold in the third column. We estimate that an increase in the METR of 10 percentage points over their average

would encourage individuals with high financial literacy to withdraw on average $180 less than individuals with low financial literacy. The estimated coefficient of the interaction term in the third column has a value relatively similar to the one obtained with the estimate across the entire sample given in Table 4. Although the marginal effect of the METR on withdrawals is significantly greater for each financial literacy group compared with the previous estimates, the difference between the effects remains relatively constant. We also see that the marginal effects of income on withdrawals align with what was previously obtained, and the coefficients increase in magnitude due to the restriction placed on the sample.

The results estimated by this model do not invalidate the previously drawn conclusions about the difference between the marginal effect of the METR on both financial literacy groups' RRSP withdrawals. On the contrary, obtaining a discernibly larger coefficient for the interaction term of the METR and financial literacy implies that individuals who made no withdrawals during the periods observed pull the coefficients towards zero slightly more for the high financial literacy group. This also explains why we estimate a statistically zero difference between the effects of the two groups' income. Since our database does not enable us to identify taxpayers who do not have an RRSP, we are unable to measure with any certainty the bias towards zero that they generate. It is also important to point out that the observations of individuals who make no withdrawals, but use the RRSP as a savings vehicle, are relevant to our estimates. Therefore, the restriction placed on the sample eliminates all observations that bias the coefficients towards zero, as well as a certain portion of valid observations that have some explanatory power over our question of interest. All told, the estimated results in this subsection enable us to assume with some degree of confidence that the bias towards zero brought about by individuals who do not use an RRSP does not affect either of the two groups in a disproportionate way that would invalidate the previously obtained results.

Robustness Tests						
	Dummy Dependent Variable			Conditional on having at least one RRSP Withdrawal between 2000-2016		
	(1)	(2)	(3)	(1)	(2)	(3)
METR * FL	-0.0005 (0.0003)	-0.0009*** (0.0003)	-0.001*** (0.0004)	-16.32* (8.498)	-13.557* (7.726)	-17.978** (7.722)
METR	-0.0015*** (0.0002)	-0.0008*** (0.0002)	-0.0004 (0.0002)	-39.901*** (5.344)	-21.167*** (4.79)	-16.353*** (4.532)
Income variables * FL						
Total income * FL		0.007*** (0.002)			15.758 (0.006)	
Total income ^2 * FL		-1.08e-08*** (2.38e-09)			-1.92e-06 (9.21e-05)	
Employment income * FL			0.010*** (0.003)			47.947 (52.629)
Employment income ^2 * FL			-3.32e-08*** (1.09e-08)			-4.06e-05 (1.5e-04)
Investment income * FL			0.004 (0.003)			132.854 (111.158)
Investment income ^2 * FL			-4.23e-09 (3.58e-09)			-0.001* (4.24e-04)
Net self employment income * FL			0.003 (0.004)			193.898 (148.713)
Net self employment income ^2 * FL			7.22e-10 (7.36e-09)			3.87e-05 (2.61e-04)
Unemployment insurance income * FL			0.015 (0.012)			263.747 (195.842)
Social assistance income * FL			0.005 (0.018)			-43.619 (484.840)
Income variables						
Total income		-0.010*** (0.001)			-238.734*** (45.455)	
Total income ^2		1.11e-08*** (2.38e-09)			2.96e-04*** (7.3e-05)	
Employment income			-0.017*** (0.002)			-255.975*** (38.707)
Employment income ^2			3.49e-08*** (1.09e-08)			3.84e-04*** (1.32e-04)
Investment income			-0.006*** (0.002)			-330.812*** (98.497)
Investment income ^2			7.59e-09*** (2.77e-09)			0.001** (4.17e-04)
Net self employment income			-0.016*** (0.003)			-553.322*** (127.019)
Net self employment income ^2			1.91e-08*** (4.95e-09)			0.001*** (1.46e-04)
Unemployment insurance income			-0.002 (0.008)			-368.986*** (118.859)
Social assistance income			-0.035*** (0.010)			-664.510 (439.506)
Intercept	0.026 (0.014)	0.019 (0.014)	0.013 (0.014)	732.773*** (211.937)	379.9 (213.173)	397.747 (210.539)
Number of observations	65,207	65,207	65,207	29,408	29,408	29,408

Table 5 – Robustness Tests: Coefficients are estimated by OLS. Robust standard deviations are shown in parentheses. Income variables are divided by 10 000. Terms for marital status and age are included, but not presented above. ***, **, * denote statistical significances at the 1, 5 et 10 percent levels, respectively.

5.3.3 Heterogeneity by demographic groups

We split the sample using six separate subsamples: men, women, Quebec, Ontario, anglophones, and francophones. The estimates of the model with interactions for each of these groups help to determine whether a difference in financial literacy level has the same impact on the marginal effect of the METR, despite the distinct characteristics of the demographic groups. The results for each subsample are presented in Table 6. For the sake of conciseness, only the third specification of the model is estimated (with detailed controls for income).

First, we see that the estimated coefficient of the term METR · FL for men is very similar to the one yielded for the entire sample, while the marginal effect among women is significantly lower. Also, for men with low financial literacy, the coefficient obtained for the METR is nearly twice the coefficient estimated for the entire sample (see Table 3). Conversely, the marginal effect of the METR on withdrawals for women with low financial literacy is not statistically significant. A plausible explanation for these results is that there may be a certain level of heterogeneity within the financial literacy groups and that the scores are distributed differently. For example, the high financial literacy group may have more women who scored at least 10/14 and a larger proportion of men may have scored higher. Different savings behaviours may be observed when comparing individuals with one or two points of difference in the questionnaire, but who are in the same financial literacy group. Also, a larger proportion of women may not make any RRSP withdrawals before retirement, which would partly explain why the estimated

Robustness Tests - Demographic Groups						
	Males	Females	Quebec	Ontario	Native Language - English	Native Language - French
METR * FL	-16.865**	-8.868*	-11.931	-22.904**	-16.481***	-8.953
	(6.935)	(5.024)	(10.253)	(9.353)	(4.837)	(8.983)
METR	-13.639***	-3.104	-7.033	0.605	-7.247***	-9.588**
	(4.343)	(2.336)	(4.996)	(5.053)	(2.534)	(4.834)
Income variables * FL						
Employment income * FL	79.514***	5.360	52.353	91.340	65.683**	48.188
	(29.456)	(54.805)	(64.395)	(74.526)	(32.435)	(61.757)
Employment income ^2 * FL	-1.5e-04**	2.03e-04	6.43e-05	-1.61e-05	-1.3e-04	2.1e-04
	(6.87e-05)	(4.42e-04)	(1.45e-04)	(1.91e-04)	(8.98e-05)	(1.71e-04)
Investment income * FL	115.552*	-24.179	440.160*	165.147	-4.003	520.817***
	(59.464)	(39.779)	(237.919)	(115.578)	(31.876)	(188.511)
Investment income ^2 * FL	-1.45e-04*	9.1e-06	-0.001*	-0.001**	6.56e-06	-0.002***
	(8.2e-05)	(3.54e-05)	(0.001)	(2.63e-04)	(3.58e-05)	(0.001)
Net self employment income * FL	122.677	115.251	55.149	260.671	45.198	310.801
	(97.350)	(124.997)	(77.209)	(224.643)	(93.221)	(308.753)
Net self employment income ^2 * FL	-3.4e-05	-0.001	0.001**	0.001	1.65e-04	-0.002
	(1.29e-04)	(4.51e-04)	(0.001)	(0.003)	(1.69e-04)	(0.003)
Unemployment insurance income * FL	206.300	91.452	244.108	561.148*	97.189	275.785
	(163.001)	(112.035)	(177.628)	(298.998)	(118.086)	(169.796)
Social assistance income * FL	-179.133	-106.676	-1123.2078	-259.189	2.456	-747.064
	(193.824)	(126.561)	(1266.7269)	(172.863)	(112.637)	(666.534)
Income variables						
Employment income	-125.157***	-138.877***	-201.835***	-182.806***	-117.718***	-211.846***
	(25.766)	(45.987)	(45.649)	(66.564)	(29.185)	(37.815)
Employment income ^2	1.636e-04**	2.19e-05	3.33e-04***	1.79e-04	1.44e-04	2.54e-04***
	(6.85e-05)	(4.36e-04)	(8.09e-05)	(1.74e-04)	(8.97e-05)	(9.15e-05)
Investment income	-153.173***	-65.393***	-510.359**	-334.783***	-41.799	-550.468***
	(55.828)	(23.837)	(233.633)	(97.144)	(24.544)	(186.423)
Investment income ^2	2.02e-04***	6.39e-05***	0.001**	0.001***	4.78e-05	0.002***
	(7.74e-05)	(2.21e-05)	(8.84e-04)	(2.52e-04)	(2.65e-05)	(0.001)
Net self employment income	-268.402***	-320.494***	-178.112***	-432.712**	-227.766***	-469.861
	(89.269)	(110.854)	(62.442)	(218.393)	(80.849)	(304.761)
Net self employment income ^2	3.09e-04***	0.001***	-0.001**	-0.001	2.61e-04***	0.002
	(1.01e-04)	(4.01e-04)	(6.35e-04)	(0.004)	(8.92e-05)	(0.003)
Unemployment insurance income	-177.964	-152.752**	-325.540***	-152.366	-104.205	-292.005***
	(96.848)	(62.214)	(90.054)	(209.599)	(74.743)	(82.573)
Social assistance income	-492.332***	-175.187***	-327.022***	-244.077	-321.939***	-375.034***
	(84.993)	(81.219)	(111.059)	(138.054)	(65.439)	(121.070)
Intercept	595.418***	-78.999	-55.774	146.297	294.715**	60.001
	(130.796)	(94.61)	(130.017)	(216.175)	(95.66)	(118.511)
Number of observations	30,971	34,152	11,852	12,008	44,192	14,856

Table 6 –Robustness tests on demographic groups: Coefficients are estimated by OLS. Robust standard deviations are shown in parentheses. Income variables are divided by 10 000. Terms for marital status and age are included, but not presented above. ***, **, * denote statistical significances at the 1, 5 et 10 percent levels, respectively.

coefficients for this subsample are closer to zero compared with men. In fact, this was the finding in the studies by Mawani and Paquette (2011) and Messacar (2017). Nevertheless, the difference in the marginal effect of the METR on RRSP withdrawals between the financial literacy groups

for women is still statistically significant at the 10% threshold, which follows the same trend as the results reported throughout this chapter.

Next, the third and fourth columns of Table 6 show the estimates for the subsamples comprising individuals from Quebec and Ontario, respectively. The estimated coefficient for the term METR · FL is statistically significant at the 5% confidence level for Ontario only. We also note that Ontario's coefficient of the METR term is very close to zero, which differs considerably from the estimates obtained for the full sample. In addition, when we add the coefficients for Ontario's METR · FL and METR terms, the marginal effect of the METR on withdrawals for the high financial literacy group obtained is very similar to the one obtained for the full sample (see Table 3). For Quebec, we cannot reject the null hypothesis that the marginal effect of the METR on withdrawals for the low financial literacy group is zero. It has been established in the literature that the savings behaviours of Quebeckers are considerably different from the rest of Canada, including the study by Lalime and Michaud (2014). For example, this study finds that Quebeckers save considerably less than the rest of Canada considering their income level, and are less likely to participate in the stock and bond markets. In the likely event that this same trend applies to our sample regardless of financial literacy level, this would mean that a larger proportion of this group does not have an RRSP or even much money in other types of savings accounts to fall back on in the event of financial difficulties. In other words, a systematic difference in savings behaviour between Quebec and the rest of Canada could potentially explain our results.

Lastly, the last two columns in Table 6 give the results for individuals whose first language is English and French respectively. We obtain estimates that are very similar to those obtained for the full sample with anglophones. However, the model estimates that the difference in marginal effect of the METR on withdrawals between the two financial literacy groups is not statistically significant for francophones. As previously mentioned, these results may in part be due to some level of heterogeneity in savings behaviours within the financial literacy groups. It is also likely that these results are attributable to systematic differences between Quebec, the province of residence of the majority of the country's francophones, and the rest of Canada.

5.4 Limitations

In this section, we briefly discuss some of the limitations that our methodology places on the explanatory power of our models.

First, our database does not contain information enabling us to determine whether individuals have an RRSP with enough money to be able to make a large withdrawal.[14] Therefore, it is expected that many taxpayers considered in our estimates bias the parameters towards zero, which is true for both financial literacy groups. This is a concern if individuals with no RRSPs account for a larger proportion of individuals in the low financial literacy group than in the high financial literacy group so the magnitude of bias is larger when literacy is low.

Second, the fact that the explanatory variable of interest in our model, the METR, is an estimate can potentially limit the robustness of our results. The tax database does not include information about spouses, so net family income cannot be calculated. This variable can determine the amount received from a number of tax credits when the individual's income puts them within the clawback area for those credits. In other words, the METR estimates may contain measurement errors. That said, in the likely event that those measurement errors are not more prevalent in either of the two financial literacy groups, we assume that the bias caused by those errors would have a minimal impact on our results.

[14] The CFCS database contains information on the total combined assets in the entire family's RRSPs. No information is provided about individuals. Also, since the CFCS is a cross-sectional survey that was conducted in 2014 and the panel data date back to 2000, the information collected by the survey may not be consistent with the individual's reality for all the years observed.

6. Conclusion

In this study, we examined the effect of the METR on RRSP withdrawals and compared how this effect varies for tax filers with high versus low financial literacy. We first showed that most taxpayers recognize tax costs when they make decisions about how much to withdraw. The estimated relationship between RRSP withdrawals and the METR is negative and statistically significant for both financial literacy groups, on average. Second, using a fully interactive linear regression model with fixed effects, we find that individuals with high financial literacy are more responsive to changes in their METRs when making withdrawal decisions. This finding suggests financial literacy helps improve savers' understanding of the tax system and the effect of the METR on their net-of-tax benefit of withdrawals.

In addition, our analysis indicates that there is a significant connection between withdrawals and income shocks, and some demographic shocks. We find that, on average, income drops increase the amount withdrawn from RRSPs regardless of the METR in the current year. Death of a spouse and divorce have significant positive marginal effects on withdrawals for those with low financial literacy. The estimated effects of demographic and income shocks on withdrawals are often greater for the low financial literacy group, suggesting that this group may have less savings in other types of accounts that they can use in the event of financial difficulty. That said, our results show that the RRSP is used as a contingency fund before retirement by both financial literacy groups, which is consistent with Mawani and Paquette (2011).

This study paves the way for future research into the impact of financial literacy on individuals' responses to various tax incentives put in place by governments. There is a variety of government programs that aim to encourage behaviours other than retirement saving (such as saving for a child's education or making charitable donations), so exploring whether the effectiveness of those programs depend on financial literacy is a promising topic for future research.

Amid Canada's aging population, the importance of deepening our understanding of retirement savings behaviours is increasingly relevant. This is also true in many industrialized countries with similar demographic trajectories. The RRSP is a savings vehicle governed by complex rules, and contributors face many decisions that can be critical to maintaining their standard of living in

retirement. It is important for effective policy-making to identify factors that help savers make better decisions and to take these factors into account when designing new policies. The findings of this study have implications for public policy insofar as they indicate efforts to increase financial literacy among the population can help many taxfilers improve their financial situations during working years and into retirement, most notably for those with low incomes.

Appendix : Optimal Timing of RRSP Withdrawals

Consider a model over two *t* periods: the first one during the individual's working life and the second one when they retire. We're looking at an individual who had previously contributed to an RRSP and is considering making a withdrawal. They receive an after-tax income y_1 at $t = 1$ and a pension benefit ψy_1 at $t = 2$, where ψ represents the income replacement rate during their working life. The marginal effective tax rates are at τ_1 during the first period and τ_2 during the second period. At $t = 1$, the individual can choose to allocate an amount S to a TEE-type savings account to finance their consumption at $t = 2$. The rest of their income at $t = 1$ is allocated to consumption c_1. The model includes a factor β that describes the individual's patience and depends on their preferences. We also introduce an endogenous variable $\phi \in [0.1]$, which is the portion of the retirement savings that the individual can choose to withdraw from their RRSP at t = 1, knowing that the remaining portion $(1 - \phi)$ must be withdrawn at t = 2. In our context, we are especially interested in the optimal value of ϕ because that is what we will be able to use to identify the variables that affect the timing of the withdrawal.

The individual's problem is solved by maximizing the amount of the utility from their consumption at t = 1 and the expected utility from their consumption at t = 2. We use a utility function that is concave up in relation to consumption. For simplicity, we use a logarithmic utility function:

$$u(c) = \ln(c)$$

Our maximization problem is represented as:

$$max_{s,\phi}\ u(c_1) + \beta u(c_2)$$

$$\text{s.c.} \qquad c_1 \leq y_1 + (1 - \tau_1)\phi - S \tag{1}$$

$$c_2 \leq \psi y_1 + (1 + r)[(1 - \tau_2)(1 - \phi) + S] \tag{2}$$

$$\phi \in [0, 1] \tag{3}$$

The Kuhn-Tucker conditions for this problem are the following:

$$(1 - \tau_1)u'_1 - \beta(1 + r)(1 - \tau_2)u'_2 + \lambda_1 - \lambda_2 = 0 \tag{4}$$

$$-u'_1 + \beta(1+r)u'_2 = 0 \quad (5)$$

$$\lambda_1\phi = 0 \quad (6)$$

$$\lambda_2(\phi - 1) = 0 \quad (7)$$

where λ_1 and λ_2 are the Kuhn-Tucker multipliers for $\phi \geq 0$ and $\phi \leq 1$ respectively, and u'_1 and u'_2 represent marginal utility of consumption for each period. We can derive solution ϕ simply by substituting the Euler equation (5) in equation (4). This manipulation gives us the following equation:

$$\beta(1+r)(\tau_2 - \tau_1)u'_2 + \lambda_1 - \lambda_2 = 0 \quad (8)$$

Equation (8) tells us that the solution for ϕ is a corner solution, in other words that ϕ = 0 or ϕ = 1. In fact, the Kuhn-Tucker conditions (6) and (7) require λ_1 and λ_2 to be greater than or equal to 0. Also, the variables λ cannot both be greater than 0 because, in that case, it would require ϕ to be equal to both 0 and 1 in order to meet conditions (6) and (7). The case where $\lambda_1 = 0$ and $\lambda_2 = 0$ is the only exception to the corner solution; however, that implies that $\tau_1 = \tau_2$ for equation (8) holds, which is highly unlikely in our context. If $\tau_1 < \tau_2$, this implies that $\tau_2 - \tau_1 > 0$ and so necessarily that $\lambda_1 - \lambda_2 < 0$ given equation (8). In this case, Kuhn-Tucker conditions (6) and (7) enable us to infer that $\lambda_1 = 0$ and $\lambda_2 > 0$, and therefore that $\phi = 1$. The reverse logic applies if $\tau_1 > \tau_2$, and it then follows that $\phi = 0$. This means that the individual withdraws all the savings in the RRSP either during the first period ($\phi = 1$) or the second period ($\phi = 0$).

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