The Tech Aficionado: Help or Harm? - A Matter of Financial Literacy

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April 2024

Abstract

This paper investigates the financial decision-making processes of "Tech Aficionados"—individuals characterized by high levels of technology usage. Using data from the Dutch Household Survey (DHS), I identify these individuals and examine their distinctive approach to information acquisition, particularly their increased reliance on the internet for financial advice and their strong belief in the impact of their skills on financial success. The study further explores how enhanced technology usage improves access to information and potentially expands opportunities for investment diversification. Additionally, the analysis considers the negative effects of technology use, especially its impact on financial prudence. The findings reveal that while Tech Aficionados are more likely to invest internationally and hold a broader range of individual stocks, they tend to exhibit lower financial caution, face challenges in managing expenditures, and prioritize spending over saving. Importantly, financial literacy emerges as a critical factor that determines whether the benefits or drawbacks of high technology usage dominate. My results indicate that technology, rather than serving as the ultimate solution, tends to magnify pre-existing behavioral tendencies.

Keywords: Behavioral Finance, Fintech, Financial Literacy, Household Finance

1 Introduction

"Technology alone is not enough" $\sim$ Steve jobs

Technology has revolutionized the financial industry over the past decade, making financial services more accessible than ever before. From making payments and obtaining loans to investing in stocks and accessing financial news, essential financial activities can now be completed with just a few taps on a digital device. While companies promote their technologies as enhancements to financial decision-making processes, the question remains: is easier, faster, and more always better? This paper investigates whether high technology usage aids or impedes individuals' financial decision-making.

One effective method for analyzing the impact of technology is through a household survey, which allows examination of the effects of high technology usage on the same individuals across various financial contexts. This includes their attitudes toward saving and spending, control over expenditures, investment behaviors, and the process of gathering financial information. Using a household survey is also beneficial because it provides a complete picture of the demographic and behavioral characteristics of these individuals. This holistic approach is beneficial for identifying in which areas technology is helpful or harmful, and more intriguingly, to whom it offers benefits and to whom it poses challenges. Existing research has often isolated the effects and behaviors associated with different technologies, which restricts the study to those already using the technology and limits the analysis to a single subsample and financial decision. Given the integral role of technology in our daily lives, it is crucial to understand how a broad range of financial decisions are influenced by these new tools.

My analysis focuses on identifying "Tech Aficionados"—individuals with high technology usage and examining whether their financial decisions differ significantly from others. Utilizing the Dutch Household Survey (DHS), I assess the adoption and usage rates of various financial tech-

nology instruments, categorizing frequent users as Tech Aficionados. I then explore their financial decision-making processes through two main channels: the Information Channel and the Financial Prudence Channel.

The internet serves as an expansive repository of information. Research in journalism and consumption has shown that news coverage has not only become more global (Arya, 2011; Perez and Breiner, 2018) but also covers a broader range of topics (Hendrickx and Van Remoortere, 2023). This increased access to information extends beyond news to products and education, facilitating a more evenly distributed attention across a variety of products rather than concentrating solely on top-selling items (Brynjolfsson, 2011), and enabling individuals to learn about new topics (Pew Research Center, 2014).

In finance, suboptimal behavior is frequently observed in individuals' financial decision-making (Barber and Odean, 2000, 2001, 2008; Grinblatt and Keloharju, 2000; Kumar and Korniotis, 2011), with some of this behavior attributed to information barriers (Kumar, 2009). Common examples include home bias (French and Poterba, 1991; Tesar and Werner, 1995; Coval and Moskowitz, 1999) and overconcentration in investments that are familiar (Grinblatt and Keloharju, 2001; Huberman, 2001). With the increased global coverage and broader access to information beyond just the most popular products and companies, the question arises: does technology use help overcome some of these information barriers and thus lead to increased use of diversification channels, such as holding international stocks and a broader range of individual stocks?

To explore how technology might overcome certain information barriers, I first establish the differences in how Tech Aficionados gather and process information. I begin my analysis with examining the sources of financial advice Tech aficionados use, focusing on categories such as professional advice, friends and acquaintances, the internet, and books to determine which sources are most and least favored. Concurrently, I investigate the impact of high technology usage on

individuals' locus of control. Having many tools at their disposal may empower individuals with the confidence and independence to seek out additional information. I find that Tech Aficionados predominantly rely on the internet as their primary source of financial advice and are less likely to depend on acquaintances or books. Moreover, they tend to exhibit higher levels of locus of control, as indicated by their responses to whether they believe financial success depends on one's own skills.

After establishing differences in information gathering, I assess whether these also lead to different investment outcomes. Specifically, I investigate whether Tech Aficionados manage to bypass the previously mentioned information barriers and make use of some of the commonly neglected diversification opportunities. I explore this through several potential channels, including foreign investment, the number of individual stocks, and the variety of asset classes.

My findings suggest that the broad access to information through the internet enables investors to overcome some information barriers. Specifically, Tech Aficionados are, on average, 1.86 times more likely to hold international stocks and typically hold 0.939 more individual stocks in their portfolios. However, technology usage does not appear to aid in diversifying asset classes; this aspect seems only significantly influenced by financial literacy. This might be because understanding different asset classes, such as bonds or options, can be complex, and mere access to extensive information does not necessarily overcome these challenges—adequate financial literacy is essential.

Additionally, the positive findings on foreign stocks and the number of stocks are derived from a subset of participants in my sample who already invest in stocks. It is reasonable to assume these individuals already possess a basic understanding of the stock market, and technological tools merely help them overcome information barriers, not knowledge barriers.

To ascertain whether all Tech Aficionados benefit from these technological tools or if only a

specific subset effectively utilizes these tools to overcome information barriers, I conducted further analysis on two subsamples: financially literate and financially illiterate individuals.

Upon reanalyzing the data based on financial literacy, I find that only the subsample of financially literate individuals drives the positive results. In other words, being a Tech Aficionado correlates with a higher likelihood of international investment and a larger portfolio of individual stocks only among financially literate individuals. Conversely, for the financially illiterate, being a Tech Aficionado appears to have no significant effect on their stock investments.

The second channel I explore in relation to Tech Aficionados is that of financial prudence. While Technology has shown some positive effects on human behavior, extensive device use has also been associated with negative impacts. Numerous studies have demonstrated that excessive technology use can reduce attentiveness and impair clear thinking (Hallowell, 2005), as well as disrupt sleep and memory (Chang et al., 2015). Moreover, new technological tools that streamline the shopping experience—such as Amazon's one-click checkout—and enhanced peer pressure through social media have increased unplanned spending (Unal et al., 2023) and the consumption of visible goods (Charles, Hust, and Roussanov, 2009). Even within the finance literature, there is evidence that Robinhood investors increased their trading activity during COVID-19 lockdowns, when they were spending more time on their devices (Ozik, Sadka, and Chen, 2020). Similarly, Barber and Odean (2002) found that switching to online trading led to more active and speculative trading behaviors that were ultimately less profitable. I aim to investigate further whether these potential drawbacks of technology are reflected across a sample representative of the entire (Dutch) population.

In my analysis, I measure financial prudence through several survey questions focused on saving versus spending patterns, financial time horizon, control over expenditures, and the average Sharpe ratios of the individual stocks held by each respondent. I use my Tech Aficionado dummy

variable as the primary independent variable to study its association with financial prudence. The results reveal that being a Tech Aficionado is associated with lower measures of financial prudence. More specifically, measured on a scale from 1 to 7 (with 1 indicating immediate spending of income and 7 indicating maximal saving), Tech Aficionados report, on average, scores that are 0.13 points lower, indicating a lower preference for saving, and 0.08 points higher in terms of difficulty to control spending, where a score of 1 suggests that controlling spending is very easy, while a score of 7 indicates significant difficulty. These results hold while controlling for other factors that might influence attitudes towards and capacity for saving, including income, education, wealth, age, risk tolerance,financial literacy and gender.

Similar to the first part of my analysis, where I examined which specific groups benefit from access to technology, I extend this examination to the domain of financial prudence. Previous research has demonstrated that financially literate individuals are better equipped to navigate challenging financial situations (Klapper and Lusardi, 2019). Consequently, financial literacy may also aid in mitigating the negative impacts of technology. To investigate this further, I explore whether the adverse effects on financial prudence are uniformly experienced across different groups by rerunning the analysis on subsamples, conditional on financial literacy levels.

The findings reveal that it is primarily the financially illiterate subsample that exhibits significant decrements in financial prudence. Specifically, financially illiterate Tech Aficionados report lower scores (-0.156) in prioritizing savings and higher scores (0.136) in expressing difficulties managing expenditures. Additionally, this group tends to select stocks in a less efficient manner, as evidenced by their lower average Sharpe ratios. These results highlight the pronounced vulnerability of financially illiterate individuals to the potential pitfalls of technology in financial management.

Finally, I examine whether technology usage, alongside financial literacy, contributes to increased participation in diverse asset classes. Lower participation in more complex asset classes

such as bonds and options may not solely be attributed to information barriers but could also stem from a lack of financial understanding i.e knowledge barriers. In this part of the study, I investigate the association between being a Tech Aficionado and participation in stocks, mutual funds, cryptocurrency, bonds, and options. I also incorporate financial literacy into my model to determine whether technology usage offers any benefits beyond what is provided by financial literacy. The findings reveal a distinct pattern: there is only a positive association between Tech Aficionados and cryptocurrency participation. Weber (2023) notes that a lack of knowledge is one of the primary reasons why people refrain from investing in cryptocurrencies, suggesting that a greater affinity for technology may facilitate an understanding of the underlying technology of cryptocurrencies. However, for other asset classes such as stocks, mutual funds, bonds, and options, there are strong and significant associations with financial literacy but not with the Tech Aficionado variable. This suggests that while access to information through technology might be helpful, it is not sufficient on its own to overcome barriers to participation in these asset classes— adequate financial literacy is necessary.

In the robustness section of my analysis, I aim to reinforce the validity of my Tech Aficionado measure by examining the counterfactuals associated with tech adoption. This involves considering the substitution effect, where high tech users are presumed to be less inclined to use older methods of payment and banking. I find that Tech Aficionados are less likely to use cash and are less inclined to conduct banking on their computers. These findings support the argument that the Tech Aficionado measure accurately identifies individuals who frequently utilize the newest technologies, and that the measure is not confounded by people who simply use more payment-related tools, regardless of whether they are new or old.

The implications of my findings are significant for policy-making and the industry, as they highlight both the positive and negative effects of technology usage on individuals and their fi-

nances. Importantly, these results underscore the critical role of financial literacy, demonstrating it as a key determinant in whether technology use potentially benefits or harms financial behavior. Rather than serving as the ultimate solution, technology appears to amplify pre-existing financial behaviors. Therefore, my findings offer crucial insights for the industry regarding the potential impacts of product design on financial decision-making, indicating that while technology may benefit certain groups (such as the financially literate), it could potentially harm others (such as the financially illiterate).

As the financial industry continues to evolve towards greater technological innovation and digitalization, the importance of financial literacy becomes increasingly paramount. This suggests that enhancing financial literacy should be a priority to ensure that the benefits of technological advancements are realized more broadly and equitably.

This paper contributes to the growing literature on individual investors and fintech usage, which explores the behaviors and consequences associated with new fintech platforms. Recent studies highlight various benefits of these technologies: D'Acunto, Prabhala, and Rossi (2019) demonstrate how robo-advising can enhance diversification and lead to less risky portfolios, particularly for those initially underdiversified. Moreover, robo-advising has been shown to mitigate cultural biases (D'Acunto, Ghosh, Rossi, 2023) and other behavioral biases (D'Acunto, Prabhala, Rossi, 2019). Fintech tools have also been effective in reducing overspending (D'Acunto, Rossi, Weber, 2019), and in the lending space, fintech has enabled borrowers who are most likely to benefit from refinancing to do so, although those with limited access to finance have not experienced similar benefits (Agarwal, Driscoll, Laibson, 2013).

However, not all outcomes are universally positive. Fuster et al. (2022) find that Black and Hispanic borrowers are disproportionately less likely to benefit from the use of machine learning in creditworthiness assessments. Di Maggio and Yao (2021) report that FinTech borrowers are more

likely to default than those using traditional financial institutions. Additionally, Pavlova et al. (2023) observe that retail investors typically lose money in zero-commission option trading, while Odean (2002) notes that individuals who switch from phone-based to online trading tend to trade more actively, more speculatively, and less profitably than before. Also, Wang and Sui (2023) show that social investing platforms lead followers to increase their positions if the stock has a higher recent return and that high-variance, high-skewness strategies are more likely to spread.

These papers highlight potential benefits and shortcomings of financial technology in their particular settings. My paper extends this stream of literature by examining the effects of financial technology usage on a population-wide scale and identifying which demographic subgroups are most likely to use these products. More importantly, my paper contributes by showing who is most likely to benefit from these new tools and who is at risk of harm.

Additionally, this paper also contributes to the literature on financial literacy, a topic extensively studied for its impact on a variety of investment decisions. Previous research highlights financial literacy's role in enhancing stock market participation (van Rooij, Lusardi, Alessie, 2011), improving retirement planning (Lusardi, Mitchell, 2011), and influencing financing decisions (Lusardi, Tufano, 2015). Moreover, financially literate individuals tend to exhibit greater financial resilience and are better at navigating periods of financial hardship (Klapper and Lusardi ,2019). Studies have also linked financial sophistication with avoiding investment errors (Calvet, Campbell, Sodini, 2009) and achieving higher levels of diversification (Guiso, Jappelli, 2008).

This paper builds on these findings by emphasizing the growing importance of financial literacy in the context of recent technological advancements in the financial industry. It explores how technology might exacerbate the divide between the financially literate and illiterate, aiding the former while potentially disadvantaging the latter. Given these implications, the findings are particularly relevant for policymakers, underscoring the need to implement effective strategies to

enhance overall financial literacy.

The rest of the paper is structured as follows: Section 2. Introduces my main Dataset the Dutch Household Survey. Section 3. Goes over the Information Channel of Tech Aficionados. Section 4. Examines the Financial Prudence of Tech Aficionados. Section 5. Looks at their asset class participation. Section 6. Goes over my robustness test and Section 7. Provides a Discussion and concludes.

2 Data and Methodology

2.1 Dutch household Survey

For my empirical analysis , I use data from the annual Dutch National Bank Household Survey (DHS). This survey covers a wide range of information about households, including demographics, assets and liabilities, and behavioral characteristics. Its in-depth coverage on financial matters has been used extensively to describe households' portfolio choice behavior (Gaudecker (2015), Dimmock and Kouwenberg (2010) ,Korniotis and Kumar (2011)).

Each year, households are randomly selected to complete the survey using computers. Special provisions are made for those without internet access to avoid selection bias. The dataset is representative of the Dutch population and includes sample weights. Covering more than 2,000 households annually, my cross-sectional analysis relies on four waves (2019 to 2022) of available data, emphasizing these later waves as earlier ones do not have all fintech usage questions necessary to compute the Tech Aficionado dummy. My final dataset has 10,621 observations. About 50% are male, 59% have college or vocational education, and the average income is €36,396. Around 33% have dependent children. Among participants, 57% are employed, and 25% are retired. In my sample 12.2% hold individual mutual funds, 9.1% hold individual stocks, 36.8% are financially

literate , i.e. consider themselves knowledgeable or very knowledgeable in financial matters. Table 1. provides summary statistics for my full sample and the subsample of interest in this study: Tech Afficionados.

I observe that tech aficionados tend to be younger on average than the general population, with an average age of 44. Interestingly, a slightly higher proportion of tech enthusiasts are women. These individuals are also notably more educated, with rougly 61% holding a college degree. In terms of economic standing, tech aficionados have higher incomes, averaging $52,874 , are employed, and a larger share resides in major cities. Summary statistics further reveal that tech aficionados are generally more financially literate, at 43.9%, yet their participation rates in stocks and mutual funds are only slightly larger.

2.2 Tech Aficionados

I derive my Tech Aficionado measure from four specific questions in the Dutch Household Survey, which examine the adoption of various payment technologies: Apple Pay (or similar services), contactless credit cards, regular use of payment apps such as Zelle, Venmo, etc., and frequent online banking on smartphones. I created indicators for high usage of these technologies, assigning a value of 1 for high usage and then computing a total score based on these indicators. [1] Consequently, I classify an individual as a tech aficionado if they meet at least 3 out of these 4 criteria. I also conduct robustness checks with various thresholds, where my main findings remained consistent. Figure 1 shows the usage distribution for the indicators I created. It shows that owning a contactless card is very common, with 89% of the sample owning one. However, other behaviors, such as using Apple Pay (26%) or regularly using payment apps (37%), are less frequent. For detailed

[1]Some questions in the survey ask about ownership, like having a contactless credit card, while others ask about usage rates. Wherever possible, I chose to focus on usage questions to make more conservative measurements aimed at identifying the top technology users

information and the exact wording of each question, please refer to the Appendix.

2.3 Financial Literacy

I define my financial literacy measure based on participants' self-assessed financial literacy, where they rate their knowledge on financial matters on a scale from "not knowledgeable" to "very knowledgeable" [2]. While using objectively measured financial literacy would be preferable, Rooji, Lusardi, and Alessie (2011) analyzed the same dataset (DHS) from earlier waves. They compared self-assessed financial literacy to objectively measured financial literacy and found a strong correlation between the self-assessed measure and the objectively measured financial literacy in this household survey. For my main analysis, I employ a scoring system where 1 signifies "not knowledgeable" and 4 indicates "very knowledgeable". I classify individuals as financially literate if they score 3 ("knowledgeable") or 4 ("very knowledgeable"), and as financially illiterate if they score 1 ("not knowledgeable") or 2 ("more or less knowledgeable").

2.4 Distribution of Knowledge

Figure 2 illustrates the knowledge distribution among the groups of interest in this study, revealing that a significant portion of the population (43.3%) is neither financially literate nor tech enthusiasts. Interestingly, only 15.83% of the population are both financially literate and tech aficionados, while 19.96% are financially literate but not tech aficionados, and 20.9% are tech enthusiasts but don't possess financial literacy. This observation is critical as it highlights that financial literacy and high-tech usage might not always coincide, showing that a considerable segment of the population falls distinctly into one category or the other. This heterogeneity enables a nuanced analysis of how these two dimensions interact, both together and separately, ensuring

[2]The exact wording is provided in the appendix

that we are not just looking at the same subset of individuals when examining the financially literate and the tech aficionados.

3 Information Channel

3.1 Information Gathering Process

Next, I analyze the impact of technology usage on the information environment of investors. Specifically, I aim to assess whether Tech Aficionados exhibit distinct information acquisition processes, gather their financial advice differently, and whether their increased access to technology enhances their financial decision-making through the application of diversification tools.

To investigate these dynamics, I first examine the information gathering patterns of Tech Aficionados. I focus on the association between Tech Aficionados and their primary sources of financial advice. Additionally, I explore their perceived locus of control to see whether Tech Aficionados also feel a greater sense of agency over their financial success. The Dutch Household Survey provides data on the primary source of financial advice, categorizing responses into four main categories: internet, family-friends-acquaintances, books, and professional advice. I use dummy variables to indicate whether a category is an individual's primary source of financial advice. Another dummy variable is created based on responses to the statement, 'Whether or not I become wealthy depends mostly on my ability.' Participants rate their agreement with this statement on a scale from 1 to 7. A high locus of control is indicated by a response of 5 or above.

Next, for each source of financial advice, I employ the following logistic regression model:

$$\ln\left(\frac{p_{FinAdvice}}{1-p_{FinAdvice}}\right) = \beta_0 + \beta_{Tech\ \ Aficionado} + CX + \tau_t + \varepsilon_{\text{prov},t} \tag{1}$$

In this equation, the dependent variables *FinAdvice* are indicator variables for the primary advice sources. The main independent variable *Tech Aficionado* represents my measure for tech-savvy users. Additionally, I include a set of control variables X , in line with Campbell (2006), which have shown to influence household financial decisions: age, income, wealth, risk tolerance, education, number of children, urbanization, and financial literacy. I also incorporate year fixed effects and cluster standard errors by year and province to account for time and regional trends.

The results, displayed in Table 2, reveal a negative association between the Tech Aficionado indicator and choosing acquaintances as the main source of financial advice. Specifically, being a Tech Aficionado is associated with 1.24 lower odds of relying on acquaintances for primary financial advice. More notably, there is a strongly negative association with using books as the primary source of financial advice, where the Tech Aficionado indicator shows an average of 1.66 lower odds of using books. Conversely, there is no significant effect on the likelihood of using professional advice among Tech Aficionados, who unsurprisingly are much more likely to turn to the internet for their main source of financial advice. Being a Tech Aficionado is associated with 1.29 higher odds of relying on the internet as a primary source of financial advice. Additionally, Tech Aficionados have 1.20 higher odds of reporting high scores on locus of control, suggesting they are more inclined to believe that financial success depends on their skills. These results underscore that Tech Aficionados engage in more internet-reliant and independent information gathering processes.

3.2 Diversification Channel

To explore whether these distinct information gathering processes lead to different investment outcomes, I turn my analysis toward the potential channels through which broader access to information might influence investment decisions. The finance literature has extensively documented the phenomenon of home bias, where investors disproportionately favor equities from their own

country (French and Poterba, 1991; Tesar and Werner, 1995; Coval and Moskowitz, 1999), often attributed to information asymmetry. With journalism becoming increasingly digital and global, it potentially lowers information barriers, enabling investors who frequently use technology to invest more readily in foreign equities.

Another aspect I examine is the number of individual stocks investors hold. A substantial body of literature indicates that investors typically maintain under-diversified portfolios and are over-concentrated in a few individual stocks—this tendency is largely due to a preference for familiar and well-understood investments (Grinblatt and Keloharju, 2001; Huberman, 2001). The internet provides a much broader set of information compared to traditional local sources, such as neighbours, or local newspapers (Watanabe (2013)). Consequently, Tech Aficionados who predominantly conduct their research online may be better positioned to overcome these diversification barriers.

Additionally, I also investigate the association between Tech Aficionados and the number of asset classes an investor holds. It is not entirely clear whether the main obstacle to diversifying into different asset classes is an information barrier or if a deeper knowledge, i.e., financial literacy, is required.

For my analysis on participation in international stocks, I employ a dummy variable to indicate whether an individual invests in foreign stocks. The logistic regression model is specified as follows:

$$\ln\left(\frac{p_{Has\ \ Foreign\ \ Stocks}}{1-p_{Has\ \ Foreign\ \ Stocks}}\right) = \beta_0 + \beta_{Tech\ \ Aficionado} + CX + \tau_t + \varepsilon_{\text{prov},t} \tag{2}$$

For analyzing the number of individual stocks and asset classes, I use these counts as my main dependent variables, with the tech aficionado measure as my main independent variable. The OLS

models are specified below:

$$Number\ of\ Stocks = \beta_0 + \beta_{Tech\ \ Aficionado} + CX + \tau_t + \epsilon_{\text{prov},t} \tag{3}$$

and

$$Number\ of\ Asset\ Classes = \beta_0 + \beta_{Tech\ \ Aficionado} + CX + \tau_t + \epsilon_{\text{prov},t} \tag{4}$$

In both the logistic regression and OLS regressions, I incorporate my main set of control variables X which are the same as in my previous analysis. Additionally, I employ year fixed effects, and cluster standard errors by year and province. The results, as shown in Table 3, indicate a positive and strongly significant association between the Tech Aficionado measure and holding foreign stocks; specifically, being a Tech Aficionado is associated with 1.85 higher odds of investing in foreign shares. I observe similar diversification benefits concerning the number of individual stocks, with a positive and statistically significant association between Tech Aficionados and the number of stocks an individual holds. On average, my Tech Aficionado measure is associated with holding 0.94 more stocks compared to a non-Tech Aficionado.

Interestingly, I find no effect of the Tech Aficionado measure on the number of asset classes held. It is important to note that the diversification measures related to equity investments were only analyzed among individuals who already hold stocks. This implies that these individuals were already somewhat exposed to financial markets, and technology seems to provide marginal information advantages. However, participation in different asset classes, which might be a greater hurdle, likely requires overcoming a knowledge barrier rather than merely an information barrier. Which might explain why I find a strongly significant and positive effect with Financial Literacy but not with my Tech Aficionado measure.

3.3 Diversification Channel: Subsample Financial Literacy

Having established the potential benefits of high technology use in enhancing financial portfolio diversification, the question arises as to whether these advantages are uniformly distributed across all investors, or if certain groups capitalize on these technological tools more effectively. Prior research, such as the work by Klapper and Lusardi (2019), has demonstrated that financially literate individuals adapt better to difficult financial situations. Consequently, these individuals might also be better equipped to leverage advanced financial technologies and adapt to a rapidly digitalizing financial landscape. To explore this hypothesis further, I will re-run the initial analysis, segmenting the data based on varying levels of financial literacy. This approach aims to discern whether financial literacy is a critical factor in maximizing the benefits derived from innovative financial technologies. Figure 3 suggests that among all stock investors, it is the financially literate and tech-savvy individuals who possess the highest number of individual stocks and the highest ownership rates in foreign stocks. Interestingly, tech aficionados who are not financially literate display even lower rates of foreign investment participation and fewer individual stocks compared to the general public, as do those who are financially literate but not tech aficionados. This indicates that a combination of both factors—technological savvy and financial literacy—is crucial to effectively recognize diversification opportunities and apply them to one's portfolio.

To investigate this more formally, I employ the same empirical model as in my previous analysis, running it separately on one subsample that includes only the financially literate i.e those who are 'knowledgeable' or 'very knowledgeable' in financial matters. I then repeat the steps with a sample of those considered financially illiterate—those who identify as 'not knowledgeable' or 'more or less knowledgeable'. The results, highlighted in Table 4, demonstrate how the previously positive effects of tech aficionados on diversification channels, such as investments in foreign stocks and the number of individual stocks, are positive and statistically significant only for the financially

literate subsample. The coefficients for the financially illiterate subsample are all insignificant and even turn negative for the international stock dummy. This suggests that not everyone benefits equally from new technological tools and that financial literacy is a crucial determinant of effective use of these tools.

4 Financial Prudence

This section of the paper turns the attention to the second key channel of interest: financial prudence. The consumption literature, including works by Parboteeah et al. (2009), De et al. (2010), and Unal et al. (2023), along with mainstream advertising, emphasize how technology has streamlined the shopping and consumption processes. Notably, features such as one-click checkout promote more impulsive and unplanned purchases (Unal et al. 2023). Additionally, 'Buy now, pay later' payment options may escalate spending, potentially leading to liquidity issues (Di Maggio et al. 2022). Similarly, the facilitation of online trading has been linked to increased trading volumes and, consequently, heightened transaction costs (Odean, 2002). These findings suggest that while technology can enhance financial decision-making, it may also foster less prudent financial behaviors.

To delve deeper into this phenomenon, I explore the relationship between the "Tech Aficionado" variable and the prudence channel through several mechanisms. First, I analyze its impact on saving versus spending decisions. This is examined using a specific question from the Dutch Household Survey, which asks respondents to rate, on a scale of 1 to 7, how much of their income they save—where 1 indicates spending all money immediately, and 7 signifies saving as much as possible.

Next, I evaluate how technology affects individuals' ability to manage their expenses. This

analysis also leverages a survey question that asks respondents to rate the ease of managing their expenditures on a scale from 1 to 7, where 1 denotes 'very easy' and 7 'very difficult'. Furthermore, I consider the financial time horizon of these individuals and the average Sharpe ratio of the individual stocks they hold[3].The analysis employs the following OLS regression model:

$$PrudenceMeasure = \beta_0 + \beta_{Tech\ \ Afficionado} + CX + \tau_t + \epsilon_{\text{prov},t} \tag{5}$$

Here, *PrudenceMeasure* represents the prudence outcome variables discussed above. The main independent variable *Tech Afficionado* quantifies the extent of technology use. The vector X encapsulates the main set of control variables utilized throughout this paper. The term τ_t denotes year fixed effects, and standard errors are clustered by year and province.

Table 6 presents the results from the regression analysis, examining the impact of being a Tech Aficionado on financial prudence. The findings indicate a statistically significant negative association between the Tech Aficionado score and the preference for saving over spending. Specifically, Tech Aficionados report on average a 0.13 lower score in their propensity to save rather than spend compared to non-Tech Aficionados. Furthermore, the analysis reveals that Tech Aficionados experience greater difficulty in managing their expenditures, as evidenced by an average increase of 0.08 in scores indicating difficulty in expense management.

However, when analyzing the broader impacts on financial behavior, including time horizons for financial planning and the Sharpe ratios of held stocks, the results show no significant effects in these areas for the full sample.

[3]Approximately 75% of my sample holds no more than three stocks. Given the concentration in few stocks as highlighted in studies like Odean (2000) and Grinblatt and Keloharju (2000), the analysis on Sharpe Ratios focuses on the first three stocks of each individual's portfolio.

4.1 Financial Prudence: Subsample Financial Literacy

Building on the initial findings regarding the influence of technology on financial prudence, this section examines whether these effects vary across different levels of financial literacy. The rationale for this additional analysis is to determine if financial literacy can mitigate some of the adverse consequences associated with high technology usage. Figure 4 shows the distribution of prudence measures across four categories of individuals: The Full Sample , Tech Aficionados that are Financially Literate, Financially Illiterate Tech Aficionados and Financially Illiterate people that are not Tech Aficionados. The Figure reveals that Tech Aficionados with low financial literacy exhibit the greatest difficulty in controlling their spending and the lowest preference for saving. In contrast, those with no tech affinity and low financial literacy also show reduced prudence, though to a lesser extent than their tech-savvy counterparts. Notably, the group displaying the highest prudence consists of Tech Aficionados with high financial literacy, indicating that financial literacy might counterbalance the less prudent behaviors seen in technologically adept individuals.

To further formalize these observations, I re-run my initial analysis on the prudence measures, now separating the data into two subsamples: financially literate and financially illiterate. The results, detailed in Table 6, indicate that the negative impacts on financial prudence—such as decreased savings and increased difficulty managing expenses—are predominantly driven by the financially illiterate subsample. Specifically, being a financially illiterate Tech Aficionado is associated with significantly lower scores of saving over spending (a decrease of 0.156) and higher scores indicating difficulty in managing expenses (an increase of 0.136). Additionally, in the financially illiterate group, there is a negative and significant association between the Tech Aficionado variable and average Sharpe ratios. The coefficient for the time horizon is negative, suggesting shorter financial time horizons, although this result is not statistically significant.

These findings underscore the dual role of financial literacy in the realm of technology-enhanced

finance. Not only does financial literacy enable investors to harness the benefits of advanced technologies, but it also acts as a critical safeguard against the potential pitfalls associated with high technology use.

5 Asset Class Selection

I expand the scope of my analysis to examine additional ways in which technology could influence financial decision-making. Specifically, I direct my focus on asset class participation. A notable benefit of technology is its role in facilitating access to a variety of financial markets through apps and websites. These platforms , allow investors to engage in diverse asset classes including options, bonds, stocks, mutual funds, and cryptocurrencies. Moreover, technology serves as a key channel for delivering essential data and news, which could potentially help investors overcome information barriers and make more informed decisions. However, it remains uncertain whether limited participation in these asset classes results primarily from insufficient access and information or from a lack of understanding. Given these insights from current research, such as the findings by Weber et al. (2023) that a fundamental lack of knowledge can prevent investors from engaging in certain asset classes[4], I now turn my attention to investigating the potential contributions of tech affinity to asset class participation. Additionally, I examine the complementary role of financial literacy, analyzing where technology might enhance effects provided by financial literacy or contribute in areas where financial literacy falls short. For my analysis I create participation dummies for individual stocks, mutual funds, cryptocurrencies, bonds, and options, with these serving as the primary outcome variables. The main independent variables include the Tech Aficionado measure

[4]Weber et al. 2023 show that one of the main reasons why people don't invest in Cryptocurrencies is because of a lack of understanding

and Financial Literacy. I employ the following logistic regression model:

$$\ln\left(\frac{p_{Asset\ \ Class\ \ Participation}}{1-p_{Asset\ \ Class\ \ Participation}}\right) = \beta_0 + \beta_{Tech\ \ Aficionado} + CX + \tau_t + \varepsilon_{\text{prov},t} \tag{6}$$

I maintain the same controls as in previous analyses and include year fixed effects and standard errors clustered by year and province. Results detailed in Table 7 show that financial literacy has a strongly positive and statistically significant association with all considered asset classes, except for cryptocurrencies, where the relationship remains positive but is only weakly significant. Conversely, the tech-aficionado measure is not associated with any asset class apart from cryptocurrencies. This suggests that while a high tech affinity might enhance understanding and exposure to cryptocurrencies, it does not significantly aid in overcoming the knowledge barriers associated with other complex financial asset classes like options and bonds. These findings reinforce the idea that while technology can help alleviate information barriers and promote understanding of technology-centric asset classes, it cannot replace the essential knowledge required to navigate traditional asset classes such as bonds, mutual funds, and options.

6 Robustness

6.1 Counterfactual of Tech Adoption

To validate the robustness of my Tech Aficionado measure, I examine the counterfactuals of technology adoption. The premise is that if an individual genuinely adopts new technologies—such as using a smartphone for payments or managing bank accounts—then a substitution effect should be observable, characterized by a decrease in the use of older technologies. Specifically, I focus on two traditional practices: cash usage and banking on a computer.

For this analysis, I define two dependent variables: a 'Low Cash Use' dummy indicating that an individual rarely uses cash, and a 'Banking on Computer' dummy reflecting frequent use of a computer for banking activities. I employ logistic regression with the Tech Aficionado measure as the main independent variable, aiming to establish whether it negatively impacts these older technological practices.

The results, presented in Table 8, indicate that Tech Aficionados are, on average, less likely to use cash and less likely to conduct their banking on a computer. These findings suggest that Tech Aficionados are substituting these older methods for newer technologies such as mobile payments (e.g., Apple Pay) and mobile banking. This evidence supports the assertion that the Tech Aficionado measure effectively captures true adoption of new technologies, rather than merely reflecting general payment activity or an increased focus on online banking.

6.2 Limitations and Future Direction

While this paper provides valuable insights into how technology usage influences financial behaviors and decision-making, there are inherent limitations that I want to address in future versions of this paper. One significant limitation is the potential for omitted variable bias or the presence of unobserved traits among Tech Aficionados that could confound the results. Currently, the analysis assumes a direct association between technology adoption and changes in financial behaviors; however, this relationship might be influenced by other unobserved factors not captured in my empirical model.

To enhance the robustness of the findings and better establish causality, this study would greatly benefit from additional identification tests. An ideal approach would involve leveraging an exogenous shock to technology usage—such as a sudden, widespread introduction of financial technologies in a previously underserved region. Such a shock could serve as a natural experiment,

providing clearer evidence that technology usage per se is the primary driver of the effects discussed. Incorporating these methods could significantly strengthen the conclusions drawn and provide more definitive guidance for policy and practice.

7 Discussion

This paper examines the relationship between technology use, financial behavior, and financial literacy, shedding light on how these elements influence financial decisions and outcomes. The findings demonstrate that while technology serves as a beneficial tool in removing information barriers, it can also induce suboptimal behaviors, notably reflected in decreased financial prudence. Importantly, technology does not uniformly benefit or disadvantage all users; instead, it tends to amplify pre-existing behaviors, which are often shaped by financial literacy.

The study reveals that tech aficionados adapt distinct information-gathering processes, characterized by a high reliance on the internet for financial advice and a greater locus of control. Notably, those who are financially literate among them are more likely to engage in a variety of diversification channels, such as investing in foreign companies and holding a larger number of individual stocks. This underscores the role of financial literacy in enhancing the capacity to leverage technological tools for financial diversification. Conversely, the findings also highlight that without sufficient financial literacy, increased technology use might lead to imprudent financial decisions. This is particularly evident among individuals with high tech adoption but low financial literacy, who tend to prefer spending over saving and struggle with managing expenses.

Therefore, the synergy between technology and financial literacy emerges as a critical determinant of financial outcomes. While technology provides tools that can simplify and improve financial management, it also necessitates a foundational level of knowledge for effective utilization.

The implications of these insights are substantial, particularly given the increasing prevalence of technology in financial markets. As Lusardi, Michaud, and Mitchell (2017) have identified, disparities in financial literacy can exacerbate wealth inequality. If technology exacerbates pre-existing behaviors, penalizing those lacking financial literacy while increasingly rewarding the financially literate, these disparities are likely to widen. This highlights the urgent need for robust financial education policies.

This research underscores the urgency for policymakers, educators, and financial institutions to implement comprehensive financial education programs that equip individuals for the evolving financial landscape. Such initiatives are crucial in ensuring that the advantages of new financial technologies are universally accessible, thereby helping to foster a more equitable financial environment.

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Figure 1: Knowledge Distribution

This figure presents the distribution of knowledge across my sample, focusing on four subgroups. 'Fin Literate - No Tech' refers to individuals who are financially literate but not tech aficionados according to my measure. 'Tech-Fin Literate' includes individuals who are both financially literate and tech aficionados. 'Tech no Fin Literate' describes individuals who are tech aficionados but not financially literate. Lastly, 'No Knowledge' categorizes people who are neither financially literate nor tech aficionados.

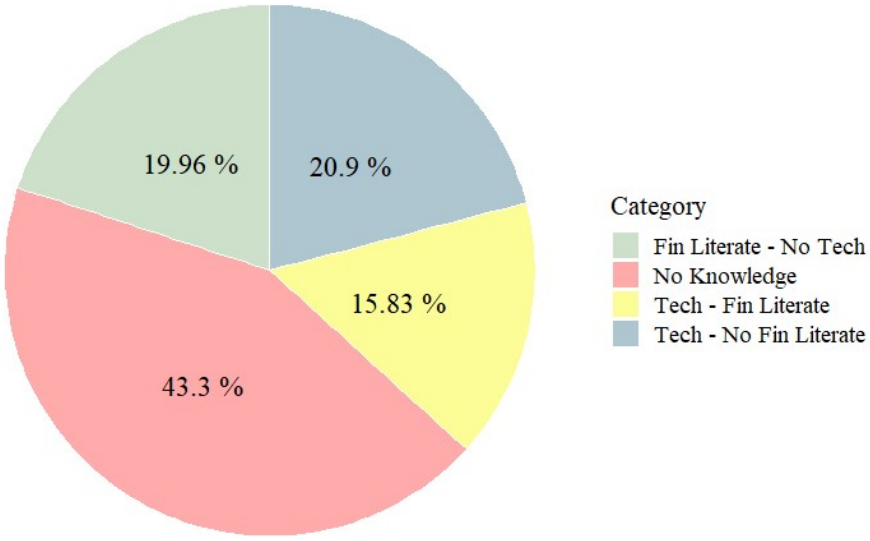

Figure 2: Adoption Rates Financial Technologies

This figure presents the adoption rates for the technologies that compose the tech aficionado measure. 'Apple Pay' is a dummy variable indicating whether an individual uses Apple Pay. 'Contactless Card' is a dummy variable indicating whether an individual has a contactless credit card. 'Payment Apps' measures whether an individual regularly uses payment apps, such as Zelle, Venmo, etc. Finally, 'Smart Phone Banking' is an indicator of whether an individual regularly conducts online banking on their smart phone.

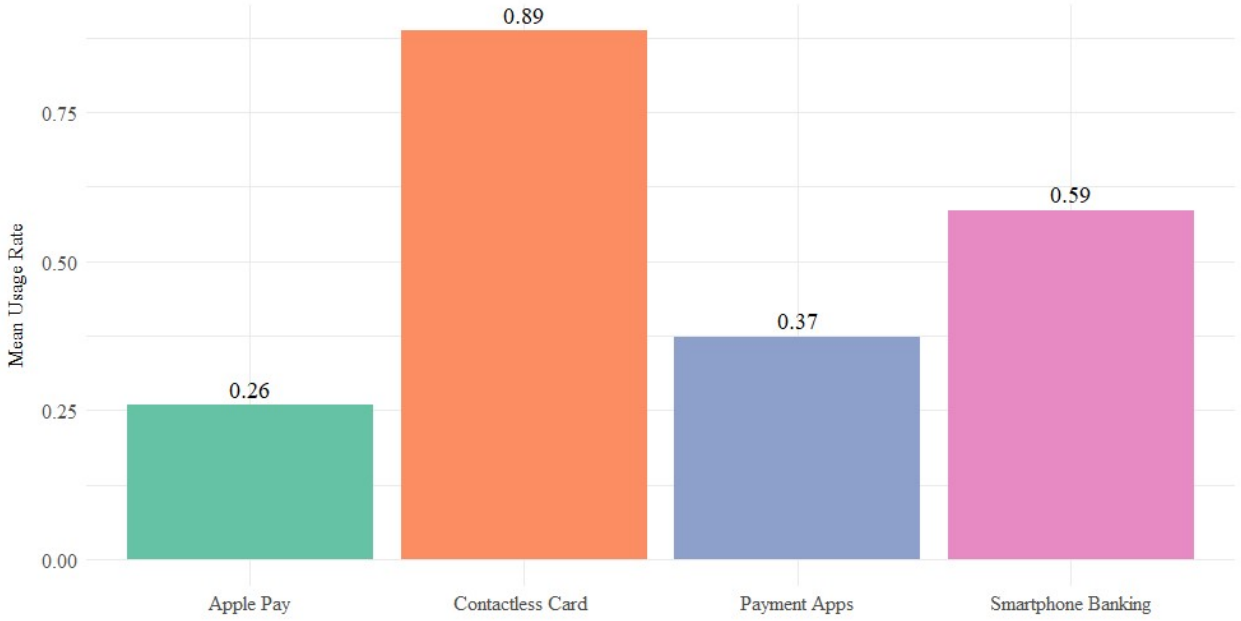

Figure 3: Diversification Measures and Tech Adoption

This figure indicates a comparison of diversification measures across different subsamples. 'Full Sample' includes the entire sample of stock investors. 'No Tech and Fin Lit' highlights the behavior of stock investors who are financially literate but not tech aficionados. 'Tech and Fin Lit' highlights the subsample that is both financially literate and tech aficionados. ‘Tech and No Lit’ highlights Tech Aficionados with low Financial Literacy

Figure 4: Financial Prudence and Tech Adoption

This figure indicates a comparison of Financial Prudence across different subsamples. 'Full Sample' includes the entire sample regardless of their participation in risky assets. 'No Tech and Low Lit' highlights the behavior of individuals who have low financial literacy and not tech aficionados. 'Tech and Low Lit' highlights the subsample that has low financial literacy and are tech aficionados.

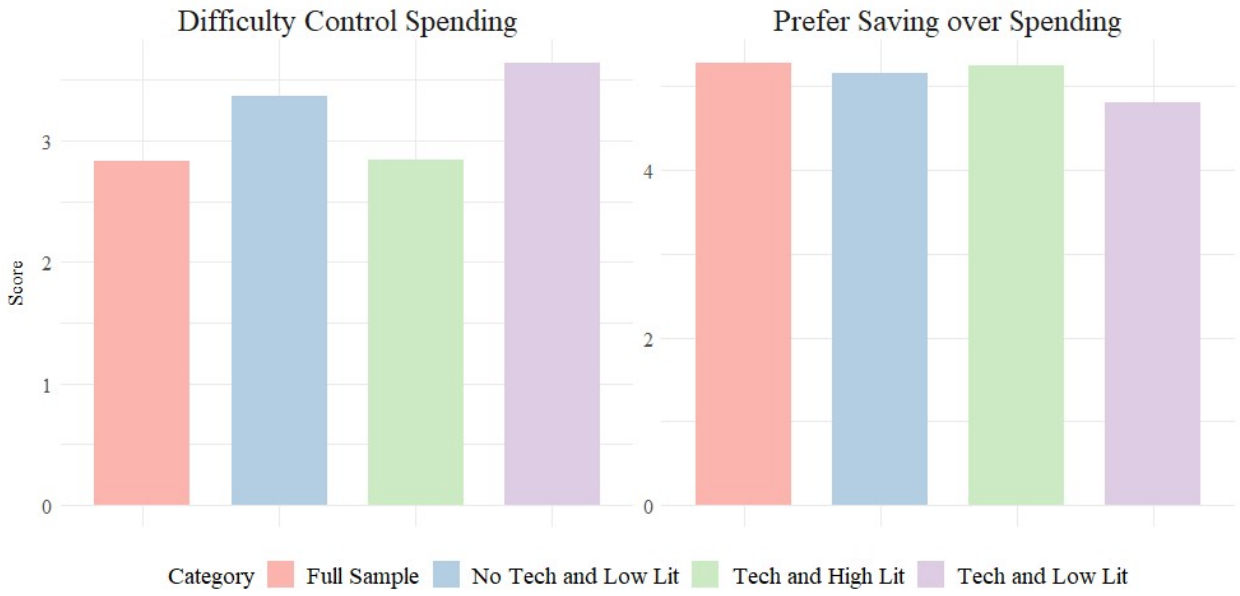

Table 1

Summary Statistics

This table reports summary statistics of the variables that enter our analysis by our main variable of interest for this study: tech savviness. The individuals in my sample are sorted based on tech adoption, as *Tech Aficionado* . We first report statistics for the full sample and then statistics for each group. For each variable, we report the number of observations, the sample average, and the sample standard deviation. Statistics are weighted by sample weights. Appendix Table A.1 presents the definitions of all variables.

	Full Sample			Tech Aficionados			
Variable	Obs	Mean	Std. dev.	Obs	Mean	Std. dev.	T-Test
Gender	10,621	0.504	0.500	3,790	0.459	0.498	-6.61
Age	10,621	53.514	17.320	3,790	43.965	14.574	-50.16
High School	10,626	0.746	0.435	3,082	0.839	0.367	23.16
College	10,626	0.587	0.492	3,082	0.608	0.488	16.76
Household Income	10,626	36,397	29,146	3,791	52,874	34,926	14.55
Financial Wealth	10,626	34,925	205,791	3,791	32,229	77,042	2.42
Total Wealth	10,626	51,268	240,475	3,791	52,510	168,008	1.97
Employed	10,626	0.568	0.495	3,791	0.742	0.438	33.49
Urbanization	10,626	0.137	0.343	3,791	0.157	0.364	4.74
Financially Literate	10,317	0.368	0.482	3,791	0.439	0.496	11.89
Holds Stocks	9,997	0.091	0.287	3,600	0.101	0.302	1.77
Holds Mutual Fund	9,997	0.122	0.327	3,600	0.134	0.341	1.65

Table 2

Financial Advice

This table illustrates the relationship between Tech Aficionados and Financial Advice. In Columns (1) - (5) I examine how the indicator variable Tech Aficionado influences the way the Investor seeks out for financial advice: (1) Advice from Acquaintances, (2) Professional Advice, (3) Self Study on the Internet, (4) Self Study through Books, (5) The belief that financial success depends on one's ability. All estimations have Year fixed effects and standard errors are clustered by year and region, I also control for financial literacy.Table A.1 presents the definitions of all variables. T-statistics are in parentheses. Standard errors are clustered by year and province. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

	(1) Acquaintences	(2) Professional	(3) Internet	(4) Books	(5) Locus of Control
Tech Aficionado	-0.217***	0.0854	0.254***	-0.508***	0.179***
	(-2.861)	(1.043)	(4.182)	(-2.850)	(2.878)
Observations	6,312	6,312	6,312	6,312	7,231
Main Controls	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Pseudo R2	0.121	0.040	0.057	0.105	0.076

Table 3

Diversification Channel

This table illustrates the relationship between Tech Afficionados and Diversification Channels. In Columns (1) - (3) I run OLS regressions to examine how the indicator variable Tech Aficionados influences the investor's diversification channels: (1) Foreign Investments , (2) Number of Asset Classes (3) Number of Individual Stocks. All estimations have Year fixed effects and standard errors are clustered by year and region.Table A.1 presents the definitions of all variables. T-statistics are in parentheses. Standard errors are clustered by year and province. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

	Has Foreign Stocks	Number of Asset Classes	Number of Stocks
	(1)	(2)	(3)
Tech Afficionado	0.620***	-0.00562	0.939**
	(3.235)	(-0.305)	(2.635)
Financial Literacy	0.317**	0.0583***	-0.0492
	(2.159)	(6.628)	(-0.170)
Constant	-4.271	2.015**	-11.26
	(-0.244)	(2.469)	(-0.834)
Observations	789	7,231	749
R-squared/Pseudo R-squared	0.0984	0.319	0.100
Main Controls	YES	YES	YES
Year FE	YES	YES	YES

Table 4

Diversification Channel: Subsamples

This table illustrates the relationship between Tech Afficionados and Diversification Channels of Financially Literate and Financially Illiterate subsample. In Panel A ,for Columns (1) - (3) I run OLS regressions to examine how the indicator variable Tech Aficionados influences the investor's diversification channels for Financially Literate Individuals: (1) Foreign Investments , (2) Number of Asset Classes (3) Number of Individual Stocks. In Panel B,for Columns (1) - (3) I run OLS regressions to examine how the indicator variable Tech Aficionados influences the investor's diversification channels for Financially Illiterate Individuals: (4) Foreign Investments , (5) Number of Asset Classes (6) Number of Individual Stocks. All estimations have Year fixed effects and standard errors are clustered by year and region.Table A.1 presents the definitions of all variables. T-statistics are in parentheses. Standard errors are clustered by year and province. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Panel A	Subsample: Fin Literate		
	Has Foreign Stocks	Number of Asset Classes	Number of Stocks
	(1)	(2)	(3)
Tech Afficionado	1.172***	-0.0178	0.879**
	(3.502)	(-0.564)	(2.096)
Financial Literacy			
Observations	449	2,722	428
R-squared/Pseudo R-squared	0.102	0.334	0.095
Main Controls	YES	YES	YES
Year FE	YES	YES	YES

Panel B	Subsample: Fin Illiterate		
	Has Foreign Stocks	Number of Asset Classes	Number of Stocks
	(1)	(2)	(3)
Tech Afficionado	-0.134	0.000	1.030
	(-0.354)	(0.002)	(1.563)
Observations	340	4,509	321
R-squared/Pseudo R-squared	0.164	0.261	0.169
Main Controls	YES	YES	YES
Year FE	YES	YES	YES

Table 5

Financial Prudence

This table illustrates the relationship between Tech Aficionados and Financial Prudence. In Columns (1) - (4) I run OLS regressions to examine how the indicator variable Tech Aficionado influences the investor's level of financial prudence (1) Preference saving over spending,, (2) Financial Time Horizon (3) Level of difficulty to control spending, (4) Average Sharpe Ratio of Primary 3 Individual Stocks. All estimations have Year fixed effects and standard errors are clustered by year and region.Table A.1 presents the definitions of all variables. T-statistics are in parentheses. Standard errors are clustered by year and province. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

	Saving over Spending	Time Horizon	Low Control Spending	Sharpe Ratio
	(1)	(2)	(3)	(4)
Tech Aficionado	-0.132***	-0.0369	0.0831*	-0.0345
	(-3.870)	(-1.156)	(1.702)	(-1.154)
Financial Literacy	0.143***	0.0940***	-0.391***	0.0311*
	(7.452)	(4.731)	(-13.09)	(1.694)
Observations	7,231	7,231	7,231	727
R-squared	0.058	0.086	0.122	0.035
Main Controls	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Table 6

Financial Prudence: Subsamples

This table illustrates the relationship between Tech Aficionados and Financial Prudence of Financially Literate and Financially Illiterate subsample . In Columns (1) - (4) of Panel A I run OLS regressions to examine how the indicator variable Tech Aficionado influences the investor's level of financial prudence for Financially Literate people in their (1) Preference saving over spending,, (2) Financial Time Horizon (3) Level of difficulty to control spending, (4) Average Sharpe Ratio of Primary 3 Individual Stocks.In Columns (1) - (4) of Panel B I run OLS regressions to examine how the indicator variable Tech Aficionado influences the investor's level of financial prudence for Financially Illiterate people in their (1) Preference saving over spending,, (2) Financial Time Horizon (3) Level of difficulty to control spending, (4) Average Sharpe Ratio of Primary 3 Individual Stocks All estimations have Year fixed effects and standard errors are clustered by year and region.Table A.1 presents the definitions of all variables. T-statistics are in parentheses. Standard errors are clustered by year and province. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Panel A	Subsample: Financially Literate			
	Saving over Spending	Time Horizon	Low Control Spending	Sharpe Ratio
	(1)	(2)	(3)	(4)
Tech Aficionado	-0.0899	0.00691	-0.0316	0.0262
	(-1.652)	(0.115)	(-0.507)	(0.665)
Observations	2,722	2,722	2,722	408
R-squared	0.035	0.092	0.078	0.063
Main Controls	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Panel B	Subsample: Financially Illiterate			
	Saving over Spending	Time Horizon	Low Control Spending	Sharpe Ratio
	(1)	(2)	(3)	(4)
Tech Aficionado	-0.156***	-0.0627	0.136**	-0.0972*
	(-3.372)	(-1.520)	(2.071)	(-1.900)
Observations	4,509	4,509	4,509	319
R-squared	0.061	0.071	0.081	0.107
Main Controls	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Table 7

Asset Class Participation

This table illustrates the relationship between Tech Afficionados and Asset Class Selection. In Columns (1) - (5) I examine how the indicator variable Tech Savvy influences the likelihood of investing in different asset classes: (1) Crypto , (2) Stocks, (3) Mutual Funds , (4) Bonds, (5) Options through a logitstic regression model. All estimations have Year fixed effects and standard errors are clustered by year and region.Table A.1 presentsthe definitions of all variables. T-statistics are in parentheses. Standard errors are clustered by year and province. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively

	(1) Crypto	(2) Stocks	(3) Mutual Funds	(4) Bonds	(5) Options
Tech Aficionado	0.378*	0.0358	-0.0511	-0.406	-0.246
	(1.871)	(0.371)	(-0.485)	(-1.461)	(-0.620)
Financial Literacy	0.183*	0.249***	0.295***	0.313***	1.595***
	(1.793)	(3.936)	(5.607)	(2.954)	(5.279)
Observations	7,231	7,231	7,231	7,231	7,231
Main Controls	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Pseudo R2	0.173	0.218	0.227	0.170	0.271

Table 8

Robustness: Counterfactual Tech Adoption

This table illustrates the results of my robustness test. In Columns (1)-(2) I study the counterfactual of Tech Adoption to strengthen the validity of my Tech Aficionado measure. Column (1) examines whether Tech Aficionado increases the likelihood of low Cash Use whereas Column (2) examines whether Tech Aficionado lowers banking activity on the Computer. Both models were run using a logit regression model. All estimations have Year fixed effects and standard errors are clustered by year and region, we also control for financial literacy.Table A.1 presents the definitions of all variables. T-statistics are in parentheses. Standard errors are clustered by year and province. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively

	(1) Low Cash use	(2) Banking on computer
Tech Afficionado	0.811***	-0.109*
	(9.946)	(-1.649)
Observations	7,231	7,200
Pseudo R2	0.084	0.049
Main Controls	YES	YES
Year FE	YES	YES