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Equity investment across age cohorts: Evidence from COVID-19

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Abstract

This paper examines the shifts in equity market participation across age cohorts in response to the exogenous shock of the COVID-19 pandemic, contributing to the field of household finance. Using the rich Dutch National Bank (DNB) Household Survey, we find a statistically significant increase in the likelihood of equity participation among younger households compared to middle-aged ones since the COVID-19 outbreak. Households led by individuals under 30 experienced an 11.7 percentage point increase in the probability of investing in equity relative to middle-aged households, while those aged 31 to 45 saw an increase of 4.7 percentage points. We employ alternative estimation methods and new controls.

JEL Classification: C33, D14, D15, G11
Keywords: Household Finance, Investment Behavior, Stock Market Participation, Age Cohorts, COVID-19 Pandemic, Exogenous Shocks

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1 Introduction

This paper focuses on the changes and determinants of the participation in equity markets during the Covid-19 outbreak, that carried a profound impact on the daily lives of people around the globe. To the best of our knowledge, this is the first systematic documentation of how the Covid-19 shock reshaped investment behavior across age cohorts, offering new evidence into generational responses to unprecedented economic uncertainty. We refer to the two main types of risky financial assets commonly examined in the literature: individual stocks and mutual funds.

Our work further contributes to the literature that explores how investors shift their investment behavior when facing an unexpected shock that increases uncertainty. The field of household finance and participation in the equity market - or simply the stock market -, has been drawing more attention from researchers for some years now. Otinga et al. (2024) identify three main clusters: standard asset pricing models; drivers and effects of stock market participation; and models of household portfolio choice through the lifecycle. Our study contributes to the two latter topics, by studying how age groups responded to the Covid-19 outbreak regarding their decision to invest in risky assets.

The pandemic embodied a considerable shock to households worldwide, with retail investors and households facing heightened and unprecedented macroeconomic and financial uncertainty. The global outbreak of the contagious virus in 2020 can, to some extent, be compared to terrorist attacks or natural disasters (Sakurai and Chughtai (2020), Rose (2021) and Goodell (2020)). These occurrences are typically unpredictable and exogenous, generating fear, financial instability and increasing uncertainty, which can shift investor behavior and influence the decisions to participate in equity markets. On the other hand, the scale and global interconnectedness of the Covid-19 crisis, combined with its dramatic economic and social disruptions, make it a unique case worthy of analysis. The global health crisis led to a reduction in working hours (Zimpelmann et al. (2021)), a shift from working in the office to working from home, or remotely, job separations and social distancing, which are likely to impact the participation of retail investors in the stock market and investment in mutual funds.

According to Shear et al. (2020), investors with a high degree of uncertainty avoidance

potentially compounded financial market instability during the Covid-19 crisis. The surge in uncertainty related to employment, income, and health, could be detrimental to household participation rates in the equity market.Cevik et al. (2022) show that positive investor sentiment reduces stock market volatility, while negative sentiment, linked for instance to the rise in infected cases, intensifies it. The volatility experienced during the pandemic was unprecedented compared to previous infectious diseases, like the Spanish Flu, surpassing even the levels observed during the 2008 financial crisis (Davis (2020)).

Traditional theories of portfolio selection suggest that when market volatility rises, households tend to shift towards safer investments, reducing their equity exposure, due to their risk averse behavior under financial market shocks. In contrast, those unusually low levels of financial trade are not observed when investors encounter the Covid-19 pandemic, which represents an exogenous and unexpected shock (see Zheng et al. (2022), for example).

Using data from the Netherlands, we investigate potential explanations for the variations in equity market participation, stock market participation, and investment in mutual funds across age groups during the global health crisis. Our main research questions are: How did equity market participation vary between age cohorts since an unexpected global shock like Covid-19? How quantitatively significant and robust are those changes? Which are the main factors that contribute to the different behavior of age groups?

This paper is organized as follows: **Section 2** presents a Literature Review of research on equity market participation; **Section 3** covers the Methodology; **Section 4** describes the Data; **Section 5** presents the Results for the different specifications; **Section 6** provides a Discussion and suggestions for further research and **Section 7** concludes.

2 Literature Review

2.1 Covid-19 and Equity Market Participation

Prior to the pandemic, researchers had already examined how investor sentiment influences investment decisions, in response to extreme, unpredictable events. Levy and Galili (2022) empirical analysis suggest that terror has a substantial negative impact on actual trade, making

investors more reluctant to trade due to the increase in fear and anxiety and an aversion to ambiguity. Wang and Young (2020) point to a fear-driven increase in risk aversion amidst terrorist attacks, which help explain the reduced flows to risky assets. In addition to terrorism, events like natural disasters that cause prolonged suffering for the population can generate fear and uncertainty comparable to Covid-19, which in turn drive changes in their investment behavior.Bharath and Cho (2022) find individuals decrease their expectations of future stock returns as a reaction to natural disasters, which leads to a drop in the ownership of risky assets. Other research suggests an increase in risk tolerance and risk-loving behavior, as Eckel et al. (2009) who study hurricane Katrina and Hanaoka et al. (2018) who examine the Great East Japan Earthquake.

As previously mentioned, the reaction of investors to the rise in volatility during Covid-19 did not abide by classical literature on portfolio choice. Ortmann et al. (2020) show there was a significant growth in the number of participants that started trading, as well as in the number of brokerage deposits and new accounts created by investors. On average, participants also traded more intensively as the number of cases of Covid-19 rose. Ülkü et al. (2023) report that an influx of working-age retail investors during the pandemic reshaped the stock market participant structure, with individual investors, including households, emerging as significant net buyers globally.

Zheng et al. (2022) propose a theoretical model to explain the rise in stock market participation during the global health crisis. They suggest that under financial market shocks, individuals tend to buy more annuities and hold riskier assets to pursue higher returns, driven by optimistic expectations of economic growth. Additionally, they highlight that the exogenous nature of the Covid-19 shock, which occasionally brought positive news, may have further fueled such optimism and contributed to increased participation. Along the same lines, Hanspal et al. (2020) underscore that individuals' beliefs about the recovery of the stock market play a crucial role in shaping their subjective economic outlook and the decisions they anticipate making. For some households, the economic downturn could be perceived as a favorable opportunity to enter the stock market, either through a long-position if you believe in a vigorous recovery of the economy after the pandemic, or through a short-position if you're more pessimistic (Ortmann

et al. (2020)).

Another reason to enter the stock market amidst the Covid-19 outbreak could be a decrease in risk aversion, despite the uncertainty installed. The health crisis led to divergent conclusions from researchers regarding risk aversion changes. Aksoy et al. (2024) find that risk seeking and willingness to take on risk increased during the pandemic, when choosing between safe and risky investments. However, there was also a greater avoidance of ambiguous or lottery-type risks. Nevertheless, as present in Umer (2023), studies from around the world find opposite changes in risk-taking preferences during the pandemic (see Frondel et al. (2021) and Bogliacino et al. (2021), for example).

The literature has explored the role of professional financial advice and financial literacy as key factors positively influencing households' equity investment (Lusardi et al. (2009), Calvet et al. (2007), Georgarakos and Pasini (2011), van Rooij et al. (2011), Von Gaudecker (2015)). Agur et al. (2020) note that the Covid-19 pandemic accentuated the importance of digital financial services, by providing a convenient means to maintain social distancing while enabling households to access online payments and financial services during the crisis. Brière (2023) crucially points to the advancement of financial technology (FinTech), mobile apps, robo-advisors, and social media in removing many of the barriers to the participation in financial markets.

2.2 Covid-19 and Market Participation Across Age Groups

The life-cycle profile of stock market participation has been extensively documented in the literature. Studies such as Poterba and Samwick (1997), Fagereng et al. (2017) and more recently Gomes and Smirnova (2021) find a hump-shaped relationship between age and stock market participation: participation increases until the 40s, remains stable during mid-life and then decreases from mid-50s onward as individuals' approach and reach the retirement age. However, these studies precede the pandemic era, which could have altered this relationship temporarily, or more permanently, making it less concave.

Age emerges as an important factor in determining risk tolerance, a key driver of investment decisions. Most prior research finds that risk tolerance reduces with age (Morin and Suarez

(1983), Grabble and Lytton (1998), Brooks et al. (2018)), with investors focusing on asset preservation near retirement. Yao et al. (2011), encounter a statistically significant 2% decrease in the likelihood of reporting any level of risk tolerance for each additional year of age, attributing this to growing concerns about potential asset losses. Nevertheless, how risk tolerance and risk aversion evolved in reaction to the pandemic is harder to grasp, as previously mentioned, and likely varies across age cohorts.

Moreover,Davis (2020), shows that volatility in the U.S. stock market can be first explained by pandemic-related news and high uncertainty regarding the recovery horizon, but later became closely associated with the governmental policy responses to the virus. The impact of news and reaction to policy responses may differ across age cohorts, driven by distinct health, economic and other personal concerns intensified by the pandemic, with age being one of the leading risk factors associated with severe outcomes of Covid-19.

These different reactions to the pandemic translated into varying investment decisions regarding risky assets, with younger individuals markedly pursuing riskier behavior. Ortmann et al. (2020), find an increase in short selling activities across all asset classes, especially pronounced for investors below 44 years of age, while older investors (above 45 years old) exhibited increased weekly trading intensity. While the authors do not explicitly associate this behavior with fear, one might draw parallels with the heightened negative sentiment described by Cevik et al. (2022).

Wheat and Eckerd (2024), from the JP Morgan Chase Institute, report that transfers of funds to investment accounts in 2023 increased compared to pre-pandemic levels, and peaked in 2021 for all both age groups, below and above 40. Notably, the participation of younger investors surged sharply from early 2020 through 2021, suggesting a potentially high degree of heterogeneity across age groups when faced with a black swan event like the pandemic.

While existing literature documents both life-cycle patterns in stock market participation and pandemic-related investment behavior, their intersection remains understudied. The evidence of increased trading activity among younger investors, coupled with distinct health and economic risks across age groups during the pandemic, suggests potential shifts in established life-cycle patterns, whose future persistence remains uncertain.

3 Methodology

3.1 Empirical Model

The decision to own risky assets (shares or mutual funds) depends on variables such as age, gender, household size, education, employment status, total net income of the household, wealth (measured by total financial assets), health, and risk-aversion (see subsection A.1). These demographic and socioeconomic variables are widely used as a control for portfolio choice in the literature (see Bonaparte et al. (2014), for example) and are a proxy for market participation costs.

To answer our research questions, we follow a Linear Probability Model with fixed effects and robust standard errors as they offer more reliability and account for heteroskedasticity. Probit or Logit models are widely used in the literature when dealing with binary dependent variables as they capture the non-linear nature of probabilities and predicted values remain within the $(0, 1)$ interval. However, these alternative models often require strong assumptions such as random effects: the assumption that unobserved household-level effects are uncorrelated with all the variables in the model. Since the DNB Household Survey allows for panel data analysis, we assume fixed effects to account for unobserved, time-invariant characteristics of the households that might impact the ownership of equity. The empirical model considered is presented below:

$$Y_{ht} = \beta_0 + \sum_{i=1}^{14} \beta_i X_{i,ht} + \alpha_h + \varepsilon_{ht} \tag{1}$$

In Equation **(1)**, h indexes households, t indexes time periods, and i is relative to variables included in the model. Y_{ht} , as the binary dependent variable, will be related to the investment in equities, stocks, or mutual funds, in the several specifications, and $X_{i,ht}$ denotes the explanatory variables across households and time. α_h captures the fixed effects for household h and ε_{ht} is the error term. Initially, we do not categorize by age groups, but instead include age and age squared in the regression to capture the quadratic relationship, with the dependent variable being the dummy for equity ownership (stocks or mutual funds).

3.2 Division into age cohorts

To examine the significant heterogeneity across age groups in their response to the pandemic and subsequent changes in participation rates, we divided households into four age groups: youngest (with 30 years old or less), young (between 31 and 45 years old), middle-aged (between 46 and 66 years old) and old (more than 66 years old). The number of observations and main statistics of each age group are exhibited in subsection A.2.

These cohorts were selected based on the assumption that different life stages come with varying financial priorities, risk tolerances, and needs, all of which could significantly influence investment decisions concerning risky assets, particularly during the pandemic. For all the models, middle-aged households are the reference group in the analysis to avoid perfect collinearity, as they were the largest cohort, and represented a baseline working-age population, experiencing fewer changes, against which other life stages are compared. Younger households, particularly those in the "youngest" and "young" categories, may be more adaptable to market fluctuations, with a higher propensity for risk-taking due to their longer time horizon and relatively lower fear of the Coronavirus. In contrast, middle-aged households, typically characterized by more stable careers, family responsibilities, and a growing need for long-term financial security, may exhibit a more conservative approach to investing. Finally, older households seem to display lower risk tolerance, less active portfolio management as they near or enter retirement (Morin and Suarez (1983), Grabble and Lytton (1998), Brooks et al. (2018)) and greater health concerns during the pandemic.

We employ a set of models that interact the indicator for belonging to a certain age cohort with the pandemic indicator, the $postcovid$ dummy, as follows:

$$Y_{ht} = \beta_0 + \sum_{i=1}^{3} \beta_i \text{AgeGroup}_{i,ht} + \sum_{i=4}^{6} \beta_i \text{AgeGroup}_{i,ht} \times \text{PostCovid} + \sum_{i=7}^{16} \beta_i X_{i,ht} + \alpha_h + \varepsilon_{ht} \quad (2)$$

This interaction allows us to distinguish the differing probability of participation in the equity market across age groups exhibited since the pandemic. We hypothesize that younger age groups increased their likelihood of participation in the equity market since the pandemic relative to middle-aged households, driven by factors such as fewer financial or family responsibilities

during the crisis, reduced health concerns and greater digital engagement that mitigated some of the challenges brought by the pandemic. Conversely, older age groups, more vulnerable to the virus and facing retirement concerns, likely exhibited a more conservative approach.
Our first hypothesis is:

H_1: Younger households increased their likelihood of investing in equities since the pandemic, relative to middle-aged households.

As a robustness check, we re-estimated the baseline model with controls (Equation **(2)**) accounting for household fixed effects, while clustering by the province where the respondent lives and the survey year. This alternative method produces heteroskedasticity-robust standard errors within the clusters and accounts for potential correlation of errors within these clusters, and tests for another assumption of how the error terms are correlated.

3.3 Additional controls

In addition to the traditional controls mentioned previously, new variables were included in the models to improve robustness, more accurately account for heterogeneity between households, and reduce the risk of biased estimates for post-Covid age cohorts caused by omitted variables. We hypothesize that younger age groups were more likely to invest in equities during the pandemic compared to middle-aged households, driven by their greater digital integration. This facilitated remote work and access to valuable investment-related and financial information during lockdowns. Such integration may have also impacted their self-reported level financial literacy, even if temporarily. Additionally, crises tend to have heterogeneous effects across economic sectors, which further shapes households' investment decisions. Our first hypothesis is:

H_2: The increased likelihood of equity investment among younger households, relative to middle-aged households, is driven by greater digital integration, financial literacy, and differing rates of employment in the service sector.

Hence, to account for potential confounding factors, we control for households' primary source of financial advice - specifically the use of digital advice - their level of financial literacy and employment in the tertiary sector. The inclusion of financial literacy and digital advice as

controls is well-supported in the literature (Goyal and Kumar (2020), Von Gaudecker (2015), van Rooij et al. (2011)), as these factors have been shown to significantly influence stock market participation. Controlling for the employment in the service sector is meant to account for structural shifts in investment behavior caused by the sectoral impact of the pandemic shown in Gunay and Kurtulmuş (2021). These three additional controls are expected to vary across age groups, as examined later.

4 Data

In this paper, 6 waves of the Dutch National Bank Household Survey (DNB Household Survey) are used, which are collected by CentERdata, associated with Tilburg University in the Netherlands. Annual data has been collected since 1993, forming a rich panel of financial, economic, and psychological data allows us to analyse retail investors' behavior throughout the years. As present on CentERdata's website [1], the DNB Household Survey was formerly known as CentER Savings Survey and was created to study the economic and psychological determinants of the saving behavior of households. Throughout the years, many questions have been either added reformulated, or eliminated from the questionnaire.

The DNB Household Survey consists of six different questionnaires, related to the labor market, health, income, investment behavior, wealth, and psychological topics. The questionnaires are presented to each member of the CentERpanel aged 16 or over. In our sample, from 2018 to 2023, more than 2,000 households participate in this project every year (see subsection B.1). The final, treated panel data has a total of 14,078 household observations. Throughout the 6 years, 3,596 distinct households participated in the survey. Household participation rates on the survey can be seen on subsection B.2. The data are collected through the Internetpanel of Centerdata (the CentERpanel) and this survey is administered over the internet. Hence, to control for self-selection issues in the sample, households without a computer and/or access to the internet are provided with a basic computer and an internet connection.

The definitions of the variables employed throughout our analysis are presented in subsection A.1. All monetary variables were adjusted for inflation to 2015 prices, using the consumer

[1] https://en.centerdata.nl/

price index of each year provided by Statistics Netherlands [2]. Although our sample begins in 2018, this figures on consumer price index by CBS Statistics are the most recent ones that we are aware of and convey an accurate source that has been revised several times. Following Dimmock and Kouwenberg (2010), we aggregate these monetary variables within households and for non-monetary variables, we take the response of the self-identified head of the household. If that is missing, we use the spouse's response. Net income, despite being a monetary variable, was created based on the responses regarding the total net income of the household, which was solicited only from the head of the household, spouse, or partner. Initially, we considered the absolute values provided in their answers. For those who did not respond, we utilized their categorical responses and converted them into monetary values by calculating the midpoints of the respective intervals.

Using data from the head of the household or spouses for non-monetary variables, as well as for net income - as it had more observations than when asked individually to the members of the household - , appears to be a sensible and pertinent choice, and it is widely used in the literature (Gomes and Smirnova (2021) for example). In fact, approximately 76% of the individuals in our sample selected to represent the household in these variables reported being the primary person involved in the financial administration of the house. Also, about 90% identify themselves as the main wage earner, and stated they have equal or greater influence over financial decisions within the house. Hence, these would be the best representatives to indicate if the house was participating in the equity market, either by owning shares or mutual funds, as well as answering to questions regarding risk aversion, education, and other demographic variables that will serve as controls.

To control for net worth, we first calculated financial assets minus debt, as an approximate measure. We followed mainly Dimmock and Kouwenberg (2010) to define debt, but added the negative checking account balances present in Alessie et al. (2002). subsection B.3 contains the detailed breakdown of the two variables: total financial assets and debt. However, due to a low response rate to debt-related questions, the net financial assets variable had very few observations in our sample. Therefore, we use total financial assets to serve as a control for

[2] https://opendata.cbs.nl/#/CBS/en/dataset/83131ENG/table

wealth.

We created the dummy college, which is 1 if the respondent for the household completed college (which includes both vocational colleges (HBO) and university education (WO)), and 0 otherwise, as the Netherlands has a Germanic education system in which the stream chosen is more relevant than the numbers of years studied. An important control is risk aversion, ranging from 1 to 6, derived from questions regarding risk taking in investment. The average risk aversion by age groups throughout the years in our data is displayed subsection B.4, with younger households exhibiting lower levels of risk aversion during the pandemic than older ones, which is in line with the findings pre-Covid in empirical literature such as Yao et al. (2011) and Brooks et al. (2018) that find risk tolerance declines with age.

The three additional controls added at a later stage - financial literacy, digital financial advice, and employment in the service sector - were plotted by age group in several graphs. Younger cohorts have a higher share that reports good or excellent levels of financial literacy (subsection B.5), but this share increases across all households since Covid. The reliance on digital platforms as the primary source of financial advice (subsection B.6) varies a lot across age groups. The question concerning the industry where individuals work was only included in 2019 in the DNB Household Survey. We divided the answers into the tertiary sector - the service sector - characteristic of developed economies, and the other sectors, which included the primary and secondary sectors. Most households are employed in the tertiary sector, and younger households report a higher share (subsection B.7). The summary statistics of the variables are presented in subsection B.8. The correlation matrix with the variables included in the models is depicted in Appendix subsection B.9. The natural logarithm of financial assets, and risk-aversion have the highest correlations with the equity ownership.

The market participation rates by different demographic groups are presented in Table 1. As it is standard in the literature, we consider as dependent variables the direct, the indirect market and the total market participation. Mutual funds also include mixed-funds, investing both in fixed-income assets and equity, so this variable includes fixed-income ownership for some households analysed.

As seen in Table 1, the total market participation, representing the decision to invest in

Table 1: Market participation rates: DNB Household Survey (2018 - 2023)

This table presents household average participation rates in different financial markets. OwnSTKMF represents ownership of stocks and/or mutual funds , OwnSTK indicates direct stock market participation, and OwnMF is the indicator for mutual fund investment. The sample period is divided into pre-COVID (2018-2020) and post-COVID (2021-2023) periods. Results are presented for the full sample and across different age groups. Definitions for all variables are available in subsection A.1.

2018-2023	**All**	**Age ≤ 30**	**Age 31–45**	**Age 46–66**	**Age >66**
OwnSTKMF					
Pre-Covid	0.1752	0.1047	0.1253	0.1895	0.2046
Post-Covid	0.1917	0.2309	0.1655	0.1902	0.2050
Δ(Post−Pre)	0.0165	0.1261	0.0401	0.0007	0.0003
OwnSTK					
Pre-Covid	0.0932	0.0556	0.0724	0.1000	0.1058
Post-Covid	0.1054	0.1672	0.1007	0.0992	0.1080
Δ(Post−Pre)	0.0122	0.1116	0.0283	-0.0008	0.0022
OwnMF					
Pre-Covid	0.1236	0.0726	0.0821	0.1375	0.1439
Post-Covid	0.1397	0.1226	0.1136	0.1460	0.1507
Δ(Post−Pre)	0.0161	0.0500	0.0316	0.0085	0.0068

shares or mutual funds or both, increases about 1.65 p.p. from the pre-covid level to post-covid, considering the whole sample of 14,078 households. The ownership rate of shares grows 1.22 p.p, and the investment in mutual funds rises 1.61 p.p., comparing the before and after Covid values.

Notably, the increase in overall market participation is largely driven by younger households, the two cohorts below 45 years old. The youngest households more than doubled their participation rate post-Covid, with a 12.61 p.p. increase in the ownership rate of overall equity compared to the pre-pandemic level. Households whose reference person is between 31 and 45 increased their participation by a third, with also a significant increase of 4.01 p.p. Conversely, older households (46 and older) essentially maintained their levels of participation in stocks, mutual funds, and total risky assets, appearing less responsive to the market disruptions caused by the virus.

A key takeaway from Table 1 is that stock market participation rates have reversed, with younger households participating as much or more than older ones after 2020. On the other hand, mutual fund investment trends remain unchanged after the shock, with older households continuing to have higher rates.

5 Results

5.1 Models with traditional controls

5.1.1 Total equity: stocks and mutual funds

The simpler baseline model that captures age without discriminating between the four different age groups helps us make a preliminary analysis (subsection C.1 (1)). The significant interaction terms between age and post-Covid, and also age squared and post-Covid, suggest that the relationship between age and the decision to participate in the equity market was altered by the pandemic. The non-linear effect captured by the interaction of post-Covid with age squared indicates that the pandemic's impact on equity investment behavior was not uniform across different age groups. The estimation results improve after incorporating various control variables, with all age-related variables becoming statistically significant at the 5% level (subsection C.1 (2)).

A key takeaway from our findings is that the positive relationship between age and equity participation weakened since the pandemic, reducing the disparity in investment behavior between older and younger ones. Specifically, while the likelihood of participation increased by 2.6% for each additional year of age in the pre-Covid period, this effect decreased by 1 percentage point during the pandemic. As a result, the net increase in likelihood for each additional year of age was approximately 1.6% post-Covid, with younger households more likely to invest in equities than before the crisis. The hump-shaped relationship between age and participation in equity markets vastly reported in the literature (Gomes and Smirnova (2021), for instance) is illustrated in the graph shown in subsection C.2.

To further analyze and distinguish the reaction of specific age groups to the pandemic, we built models to capture this heterogeneity, whose results are presented on Table 2, using robust

Table 2: Linear Probability Model for Total Equity Ownership

The table below reports the coefficients of the variables listed on the first column, using the whole sample from 2018-2023. The dependent variable is the dummy for total equity ownership, ownSTKMF. Households between 46 and 66 years old are the reference group. Fixed-effects are accounted for, and p-values are in parentheses. Significant at *10%, **5%, ***1%. Definitions of variables are presented in subsection A.1.

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Constant	**0.195*** **	**0.192*** **	**0.147*** **	**0.133*** **	−0.046	0.091
	(0.000)	(0.000)	(0.000)	(0.000)	(0.356)	(0.184)
Post-COVID	0.005	9.22e-06	0.001	0.001	−0.005	−0.010
	(0.105)	(0.999)	(0.867)	(0.850)	(0.350)	(0.107)
Age ≤ 30	−0.033	−0.031	−0.025	−0.024	−0.025	**−0.061***
	(0.267)	(0.311)	(0.409)	(0.432)	(0.485)	(0.089)
Post-COVID × Age ≤ 30	...	**0.064*** **	**0.062*** **	**0.057** **	**0.074*** **	**0.117*** **
	(...)	(0.006)	(0.008)	(0.014)	(0.007)	(0.005)
Age 31 – 45	−0.026	**−0.033** **	**−0.030***	**−0.029***	−0.031	**−0.041** **
	(0.117)	(0.049)	(0.080)	(0.088)	(0.125)	(0.048)
Post-COVID × Age 31 – 45	...	**0.029*** **	**0.027** **	**0.026** **	**0.034*** **	**0.047*** **
	(...)	(0.010)	(0.016)	(0.021)	(0.007)	(0.002)
Age > 66	−0.018	−0.009	−0.011	−0.010	−0.017	−0.022
	(0.104)	(0.431)	(0.362)	(0.438)	(0.224)	(0.178)
Post-COVID × Age > 66	...	−0.006	−0.006	−0.005	−0.001	0.005
	(...)	(0.370)	(0.405)	(0.413)	(0.880)	(0.535)
Male	...	...	**0.038***	**0.038***	**0.047** **	0.030
	(...)	(...)	(0.065)	(0.064)	(0.041)	(0.215)
Household Size	...	...	0.009	0.009	0.006	0.006
	(...)	(...)	(0.249)	(0.266)	(0.477)	(0.492)
College	...	...	...	**0.036***	**0.055** **	**0.089*** **
	(...)	(...)	(...)	(0.080)	(0.023)	(0.005)
Unemployed	...	...	...	0.025	0.031	**0.043** **
	(...)	(...)	(...)	(0.119)	(0.101)	(0.038)
Retired	...	...	...	−0.001	−0.008	0.005
	(...)	(...)	(...)	(0.952)	(0.581)	(0.772)
Ln(Financial Assets)	...	...	...	...	**0.019*** **	**0.020*** **
	(...)	(...)	(...)	(...)	(0.000)	(0.000)
Ln(Net Income)	...	...	...	...	0.001	− 0.001
	(...)	(...)	(...)	(...)	(0.846)	(0.825)
Health	...	...	...	...	...	0.007
	(...)	(...)	(...)	(...)	(...)	(0.118)
Risk Aversion	...	...	...	...	...	**−0.028*** **
	(...)	(...)	(...)	(...)	(...)	(0.000)
Observations	11,079	11,079	11,079	11,063	9,657	7,753
Adjusted R-squared	0.8406	0.8410	0.8411	0.8412	0.8538	0.8529
Within R-squared	0.0012	0.0042	0.0053	0.0061	0.0186	0.0332

standard errors and fixed effects as discussed in the Methodology, section 3 .

Younger households (until 45 years old) appear to significantly change their behavior after Covid erupts, before controlling for any demographic, socioeconomic or financial variables (see Table 2 (2)). subsection C.3 shows the coefficient plot of this model. Compared to middle-aged households, young cohorts exhibit a positive change in the likelihood of investing in equities post-Covid. Conversely, these younger households had a lower likelihood of participating in the equity market before the Covid shock, which is also significant for households with 31 to 45 years old.

We confirm our findings in further refined specifications, where we progressively add more controls, as shown in Table 2. Notably, the main results crucially hold after adding the controls that are commonly present in the literature analysing households' participation in equity markets using the DNB Household Survey (Bonaparte et al. (2014), for example). The exogenous shock of the Covid-19 pandemic had such a profound impact on investment decisions that it drastically increased the probability of investment in mutual funds and/or stocks among younger age groups relative to middle-aged households. Specifically, households under 30 years old experienced a statistically significant 11.7% increase in their probability of investing in equities post-Covid, while households with a reference person aged 31 to 45 saw a 4.7% increase in their likelihood of investing in stocks and/or mutual funds post-Covid, compared to middle-aged households. Yet, the net effects of 5.6% (11.7% - 6.1%) for the youngest cohort and 0.6% (4.7% - 4.1%) for young homes are not statistically significant, preventing us from drawing definitive conclusions about the post-pandemic probability of investment of younger households relative to middle-aged ones. Meanwhile, households with a reference person aged 66 or older did not show any significant changes in either period, when compared to to middle-aged households.

Graduating from college, being unemployed, and the amount of financial assets owned are statistically significant factors that positively impact the likelihood of investing in equities. Conversely, as expected, risk aversion is statistically significant and has a negative influence on the ownership of equities. A one-unit increase in risk aversion reduces by 2.8% the probability of participating in equity markets, considering the whole sample, which aligns with traditional theory from finance and behavioral economics. The coefficients of the baseline model by age

group post-Covid, from the specification in column (6) of Table 2, were plotted in the coefficient plot depicted in subsection C.4.

5.1.2 Separating stocks and mutual funds

We replicate the baseline model by adding controls progressively, and considering stock market participation as the dependent variable, instead of overall participation. The results are similar and are reported in subsection C.5. For both cohorts of younger households, whose head of the household is below 45 years of age, the effect of Covid on stock ownership is statistically significant at the 1% level. Compared to middle-aged households (46–66 years old), youngest households ($\leq$ 30 years old) witnessed a 10.7% increase in their probability to own stocks post-Covid, while young households (31–45 years old) saw a 3.5% increase, taking into account all controls. This signals a strong shift toward stock ownership among younger age groups relative to middle-aged households since 2021. Before Covid, youngest households appear to be 2.7% less likely, and young households 1.3% less likely to own stocks compared to middle-aged homes, but these results are not statistically significant. Although post-Covid increases are highly statistically significant, we cannot establish a post-Covid level of probability of stock ownership of younger households compared to middle-aged ones since the net effects are not statistically significant. Senior households exhibit a reduced impact, indicating a likelihood of owning stocks that is not statistically different from that of middle-aged households, but these results are statistically insignificant. Risk aversion, the level of financial assets, and gender are statistically significant in explaining stock ownership across both periods.

We followed the same process for mutual fund ownership (subsection C.6). The results for this specification are less straightforward, as mutual funds encompass not only risky assets but also mixed funds, which include fixed-income holdings. After controlling for all baseline variables, homes with 31 to 45 years old still stand out as having 2.9% more likelihood of investing in mutual funds than middle-aged households after Covid, and this is a statistically significant effect. Table 3 summarizes the results of including all the baseline controls, for the

Table 3: Linear Probability Model for Equity Ownership, Stocks, and Mutual Funds

The table below reports specifications with all baseline controls using the whole sample from 2018-2023. The dependent variables are the dummy for ownership of equity, ownSTKMF,(1), stocks, ownSTK, (2), and mutual funds, ownMF, (3). Households between 46 and 66 years old are the reference group. Fixed-effects are accounted for, and p-values are in parentheses. Significant at *10%, **5%, ***1%. Definitions of variables are presented in subsection A.1.

Variables	**(1)**	**(2)**	**(3)**
Constant	0.091	0.057	0.032
	(0.184)	(0.290)	(0.606)
Post-COVID	−0.010	−0.005	−0.002
	(0.107)	(0.299)	(0.663)
Age ≤ 30	**−0.061***	−0.027	−0.017
	(0.089)	(0.313)	(0.544)
Post-COVID × Age ≤ 30	**0.117*****	**0.107*****	0.020
	(0.005)	(0.003)	(0.550)
Age 31 – 45	**−0.041****	−0.013	−0.020
	(0.048)	(0.306)	(0.294)
Post-COVID × Age 31 – 45	**0.047*****	**0.035*****	**0.029****
	(0.002)	(0.009)	(0.020)
Age > 66	−0.022	0.018	**−0.039****
	(0.178)	(0.161)	(0.033)
Post-COVID × Age > 66	0.005	$2e^{-4}$	0.006
	(0.535)	(0.980)	(0.508)
Male	0.030	**0.044****	0.028
	(0.215)	(0.011)	(0.240)
Household Size	0.006	−0.001	**0.010***
	(0.492)	(0.926)	(0.079)
College	**0.089*****	0.034	**0.090*****
	(0.005)	(0.203)	(0.001)
Unemployed	**0.043****	0.020	**0.043****
	(0.038)	(0.161)	(0.037)
Retired	0.005	−0.007	0.015
	(0.772)	(0.614)	(0.462)
Ln(Financial Assets)	**0.020*****	**0.008*****	**0.017*****
	(0.000)	(0.006)	(0.000)
Ln(Net Income)	−0.001	0.002	−0.003
	(0.825)	(0.339)	(0.467)
Health	0.007	−0.005	0.001
	(0.118)	(0.299)	(0.822)
Risk Aversion	**−0.028*****	**−0.014*****	**−0.016*****
	(0.000)	(0.001)	(0.000)
Observations	7,753	7,753	7,753
Adjusted R-squared	0.8529	0.8441	0.8225
Within R-squared	0.0332	0.01179	0.0185

dependent variables: total ownership of equity, stocks and mutual funds.

Post-Covid growth in market participation exhibited significant age-based heterogeneity. Households aged 31-45 demonstrated markedly different investment behavior in all specifications relative to middle-aged households (46-66). The reference group showed no significant behavioral changes following the health crisis, as evidenced by the insignificant post-Covid coefficient, and older households' (>66) market participation patterns seem to have remained relatively stable throughout the period. The results displayed on Table 3 could signal a structural shift in younger households' market participation rather than a transitory Covid-induced response. However, additional research is needed to determine the permanence of these changes.

An alternative methodology was implemented to attest the robustness of our results, by accounting for within-province correlation of errors and temporal dependence within years, and thus clustering by province and survey year. The results using fixed effects and clustering (instead of robust standard errors) are illustrated in subsection C.7, which is to be compared with Table 3. The alternative specification leads to the same conclusions as outlined above, with younger age groups showing a statistically significant and substantial increase in the probability of investing in equity after the onset of the pandemic, with coefficients of similar magnitude to the ones seen in Table 3 post-Covid.

5.2 Adding extra controls

After the baseline specification with controls, we explore the level of financial literacy, the most important source of financial advice of households and the economic sector where the reference person for the household is employed, as relevant controls that affect the decision to invest in equities. As seen in subsection B.5, subsection B.6 and subsection B.7, these factors exhibit substantial variation in our data, both across age groups and after the Covid-19 outbreak. These variables are also particularly relevant during the Covid-19 period, as digital tools, financial knowledge, and sectoral employment patterns may have influenced stock market participation. The results of the baseline specification with these additional controls are displayed on Table 4.

All the new controls are statistically significant to investing in stocks and/or mutual funds.

Table 4: Linear Probability Model for Total Equity Ownership, with Extra Controls

The table below reports the coefficients of the variables listed on the first column, using the whole sample from 2018-2023. The dependent variable is the dummy for total equity ownership, ownSTKMF. Households between 46 and 66 years old are the reference group. Fixed-effects are accounted for, and p-values are in parentheses. Significant at *10%, **5%, ***1%. Definitions of variables are presented in subsection A.1. Control variables present in Table 2 and Table 3 were included, but not reported below.

Variables	**(1)**	**(2)**	**(3)**
Constant	**0.126***	**0.125***	**−0.185***
	(0.079)	(0.080)	(0.074)
Post-COVID	−0.007	−0.007	−0.008
	(0.258)	(0.256)	(0.281)
Age ≤ 30	**−0.068***	**−0.069***	−0.072
	(0.061)	(0.058)	(0.176)
Post-COVID × Age ≤ 30	**0.123*****	**0.123*****	**0.097****
	(0.003)	(0.003)	(0.050)
Age 31–45	**−0.041****	**−0.041****	−0.023
	(0.034)	(0.036)	(0.218)
Post-COVID × Age 31–45	**0.050*****	**0.050*****	**0.050****
	(0.002)	(0.002)	(0.013)
Age > 66	−0.003	−0.003	−0.015
	(0.853)	(0.838)	(0.509)
Post-COVID × Age > 66	0.004	0.004	0.005
	(0.616)	(0.635)	(0.592)
Baseline Controls	...	...	...
	(...)	(...)	(...)
Digital Advice	**0.018****	**0.018****	**0.017****
	(0.016)	(0.020)	(0.050)
Good Financial Literacy	....	**0.014***	**0.023****
	(...)	(0.096)	(0.026)
Services	...	...	**0.042****
	(...)	(...)	(0.022)
Observations	6,861	6,861	4,506
Adjusted R-squared	0.8515	0.8516	0.8743
Within R-squared	0.0338	0.0345	0.0490

We find that digital advice, such as financial information available on the internet and financial software programs, increases the likelihood of investing in risky assets by nearly 2% , compared to households using other sources of advice. We argue that digital financial advice likely enhances financial literacy by providing a convenient means to gain technical financial

knowledge while lowering barriers to entry and encouraging households to invest.

Households with a good level of financial literacy are 2.3% more likely to invest in stocks and/or mutual funds compared to those reporting poor financial literacy, as indicated by the $good\_finlit$ dummy variable. This finding is in line with van Rooij et al. (2011), for example, who find that those with low literacy are less likely to invest in stocks. It is possible that a lack of financial literacy among older households, driven by the decline in cognitive processes related to decision-making (Lusardi et al. (2009), Finke et al. (2011)), could help explain the age-based heterogeneity observed in the baseline models. Although having a good level of financial literacy is statistically significant, it does not alter the post-Covid coefficients for the age groups when included in the specification (Table 4 (2)). Thus, this hypothesis does not appear to hold.

Working in the service sector, the tertiary economic sector, increases households' probability of participating in the equity market by 4.2%, compared to working in other sectors. This is possibly explained by the fact that many individuals employed in the service sector likely transitioned to remote work, maintaining stable employment and income throughout the entire period analysed. Adding this control significantly alters the coefficient of the interaction term of youngest households and post-Covid, reducing it to 9.7% rather than 12.3%, likely due to the high share of youngest households working in the service sector, as previously seen (subsection B.7).

After adding the new controls, the interaction terms of post-Covid with the younger age groups remain significant, with these households exhibiting a 9.7% and 5.0% increase in the probability of investing in shares and/or mutual funds since the pandemic in comparison to middle-aged households.

6 Discussion and Further Research

Our findings reveal a notable shift in investment patterns among age cohorts since the health crisis, with younger households demonstrating heightened probability of investing in equities relative to middle-aged ones after the exogenous shock. The second method, with clustering by province and year, adds to the robustness of our findings by demonstrating their consistency under different assumptions about how the error terms are correlated.

6.1 Discussion of the findings

Several factors can explain our results. In our data, younger households exhibit lower levels of risk aversion during the pandemic than older ones (subsection B.4), which is in line with the findings in empirical literature such as Yao et al. (2011). While younger households' increased propensity to invest persists when analyzing direct stock market participation, this effect becomes statistically insignificant for mutual fund investments. Hence, young investors not only increased their market participation but also exhibited a preference for potentially higher risk, by choosing direct equity investments over professionally managed mutual funds. This aligns with the risk-seeking behavior during the pandemic found in Aksoy et al. (2024) and could help explain age cohort differences. Nonetheless, since risk aversion is already controlled for in all our models, other factors contribute to the findings.

The surge in digital financial advice and possible changes in financial literacy during the pandemic should not be overlooked and are statistically significant controls. These variables may have reduced participation costs for households, as individuals found themselves with more free time and fewer barriers to entry, making it easier to begin investing. Furthermore, these effects are likely to differ across age cohorts, as older households tend to be less digitally integrated and less financial literate, which could translate into a reduced adaptation to the pandemic. After controlling for them progressively, results remain statistically significant (Table 4), indicating the need for different perspectives.

6.2 Alternative explanations

Other factors, that the data didn't allow to test for, such as optimistic expectations about economic recovery (Zheng et al. (2022)), along with more free time at home to focus on financial decisions (Eliner (2022)) and health concerns, are possible contributors to the growth of stock market participation during lockdown. While the self-reported level of health was not a statistically significant control, acknowledging the core nature of the global shock in 2020 - a health-driven crisis - and consequent health concerns it spurred, might also be fundamental to interpret our results. The spread of a virus affecting mainly the most vulnerable ones, and senior households, could have played a role in shaping health concerns and risk preferences among

older groups. In fact, age was the strongest risk factor for severe Covid-19 outcomes as shown by statistics around the world, with the risk of death being about 25 times higher for those between 50-64, compared to individuals below 30 years old, and 140 times higher for those aged 75-84 [3]. One possibility is that younger households viewed the pandemic as an opportunity to engage in riskier investments, as they had reduced health concerns as well as optimistic expectations about economic recovery and expected returns, while older cohorts experienced heightened health concerns and were more influenced by fear and negative sentiment, which in turn made them less inclined to invest.

6.3 Limitations of our approach

One limitation is that our analysis was conducted using Dutch data, and changes in stock market participation might be partially explained by idiosyncratic characteristics of the Netherlands. The OECD better life index points out that the country has better-than-average education, work-life balance, safety, and life satisfaction, with employment rates above the OECD average [4]. There is also a high level of job security, as expected loss of earnings when workers become unemployed are dampened by the social safety nets and government's financial assistance, which attest for the strength of the Dutch labor market. Despite these country-specific factors, the broader trends in investment behavior in response to the Covid-19 pandemic are in tandem with many countries around the world, and offer valuable insights to understanding the reaction of age cohorts in periods of uncertainty.

The fact that it wasn't possible to separate shares-funds from mixed-funds in mutual fund ownership could be seen as a constraint to the analysis, as they include fixed-income securities. Nevertheless, our findings regarding stock market participation (subsection C.5) attest for the reliability of our main results (Table 2), by directly reflecting younger households' decision to engage with the more volatile and riskier segment of the market since the pandemic.

A Linear Probability Model (LPM) was chosen to account for household fixed effects in our six-year panel data, which included the pandemic years. However, the LPM has limitations, as its functional form does not constrain predictions within the $(0, 1)$ interval, as illustrated in

[3] https://www.cdc.gov/covid/hcp/clinical-care/underlying-conditions.html
[4] https://www.oecdbetterlifeindex.org/countries/netherlands/

subsection C.2. Future research could potentially employ Probit or Logit models in order to ensure predicted values remain within $(0, 1)$ and account for non-linearity. Yet, these alternative models are challenging to implement with panel data when incorporating fixed effects, and require additional assumptions, as discussed in the Methodology. Hence, despite its limitations, the LPM remains a widely used approach in the literature for binary outcomes, and offers benefits given the focus of our analysis and the inclusion of household-level fixed effects.

6.4 Further Research

The Dutch National Bank's comprehensive panel-data Household Survey provided a valuable foundation for analyzing changes in equity participation during the virus outbreak. Further research could empirically investigate whether younger households not only increased their probability of participation, but also shifted their portfolios toward riskier assets. A challenge encountered is that there is a significantly lower response rate to follow-up questions asking about the market value of assets. Moreover, reliability of these self-reported market values poses additional concerns, which could require a different scope of work to effectively address incomplete data with sophisticated methodology.

Another interesting direction for further study lies in the intersection of equity market participation and alternative investments, such as cryptocurrencies. During the pandemic, cryptocurrencies like Bitcoin gained significant attention, and they could potentially serve as a reflection of investors' expectations regarding economic recovery and their desire to seek financial independence from the government and other institutions, particularly in times of high uncertainty.

7 Conclusion

Examining the drivers of investment behavior takes on added importance when analysed in the context of crises, such as the Covid-19 pandemic. The study of households' investment decisions for different demographic groups under stress provides valuable insights for researchers, financial institutions, and policymakers, with implications for the improvement of economic resilience at the household level. Our study addresses the existing gap in the literature by

empirically examining how age-specific responses to the pandemic shaped household portfolio decisions. If the age-based changes in investment behavior induced by the pandemic persist, the hump-shaped life-cycle pattern of investment could suffer alterations, further facilitated by the reduction in participation costs due to technological advancements.

We find substantial heterogeneity across age groups regarding their changes in participation rates in reaction to the pandemic. To the best of our knowledge, this is the first paper to empirically quantify the impact of Covid on investment decisions by age. We empirically demonstrate the increased likelihood of younger households to invest in equities, as compared to middle-aged households since the health crisis, which contrasts with the trend observed prior to the shock. This dynamic holds after controlling for demographic, socioeconomic, and financial variables. The alternative method employed, where standard errors are clustered by province and year, further attests to the robustness of our findings.

Additional factors that influence the participation in the equity market, such as the main source of financial advice of households, their self-reported level of financial literacy, and the economic sector where they work, were controlled for in a later stage. We also suggest that the distinct changes in risk-aversion across age groups could have impacted the results. After adding all relevant controls, the main findings still hold, and we attribute that to two alternative explanations. Health-related concerns could have led to more conservative approaches to investing by senior households, which were particularly vulnerable to the virus. We also argue that varied economic expectations about the duration and the recovery from the pandemic could have affected investment decisions, leading to divergent approaches by age cohorts, with younger individuals showing greater optimism. We suggest that further research is needed.

Our research contributes to the ongoing discourse on how crises and exogenous shocks affect financial decision-making and investment behavior. The novelty, relevance, and robustness of our investigation, in the context of an exogenous, transversal, and major health-crisis, suggests individuals indeed adapt investment decisions to unexpected circumstances. Data made available in the coming years should help us determine if this pattern is sustained, representing a longer-term change.

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Appendix

A Methodology

A.1 Variable definitions

This table presents the definitions of all the variables employed in the specifications, including traditional and additional controls.

Variable	Definition
OwnSTKMF	One if owns shares or invests in mutual funds, and zero otherwise.
OwnSTK	One if owns shares, and zero otherwise.
OwnMF	One if invests in mutual funds, and zero otherwise.
Age	Years old of the respondent that represents the household.
Age2t100	Age squared and multiplied by 100.
Male	One if the respondent is male, and zero otherwise.
HHsize	Number of household members.
College	One if graduated from college, which includes both vocational colleges (HBO) and university education (WO), and zero otherwise.
Unemp	One if the respondent is unemployed, and zero otherwise.
Retired	One if the respondent is retired, and zero otherwise.
Ln_Finassets	Natural logarithm of total financial assets. Total financial assets are defined in Appendix A2.
Ln_Netinc	Natural logarithm of total net income of the household.
Health	General health measured from 1-5 where 1 is very bad and 5 is very good.
Risk_Aversion	Risk-aversion related to investing ranging from 1-6 where 1 is low risk-aversion and 6 is high risk-aversion.
Digital_Advice	One if digital advice is the most important source of financial advice, and zero otherwise.
Good_Finlit	One if knowledgeable or very knowledgeable with respect to financial matters, and zero otherwise.
Services	One if employment in the service sector, and zero otherwise.

A.2 Main Statistics of Age Cohorts

This table presents the number of observations, average age and standard deviation by age group. The data refers to 6 waves of the DNB Household Survey, from 2018 to 2023.

Age Group	Observations	Mean	Std. Dev.
Youngest ($\leq$ 30)	963	26.33	3.02
Young (31−45)	3,088	38.39	4.21
Middle-aged (46−66)	5,632	56.27	6.04
Old ($>$ 66)	4,395	74.87	6.06
Total	14,078	-	-

B Data

B.1 Number of respondents of the DNB Household Survey by year

This table shows the number of households that respondended to the questionnaire in each of the 6 waves, from 2018 to 2023. The number of households analysed each year is above 2,000.

Survey Year	Observations	Percentage	Cumulative
2018	2,165	15.38	15.38
2019	2,535	18.01	33.39
2020	2,417	17.17	50.55
2021	2,354	16.72	67.28
2022	2,275	16.16	83.44
2023	2,332	16.56	100.00
Total	14,078	100.00	-

B.2 Participation rates of households in the DNB Household Survey (2018-2023)

The table below provides a count of households based on their participation frequency: how many households were present in all 6 waves, 5 waves, 4 waves, and so on. This illustrates the survey participation persistence of households: around 75% participate 4 or more times across the 6 years.

	Observations	**Percentage**	**Cumulative**
1 time	755	5.36	5.36
2 time	840	5.97	11.33
3 time	834	5.92	17.25
4 time	1,136	8.07	25.32
5 time	3,205	22.77	48.09
6 time	7,308	51.91	100.00
Total	14,078	100.00	-

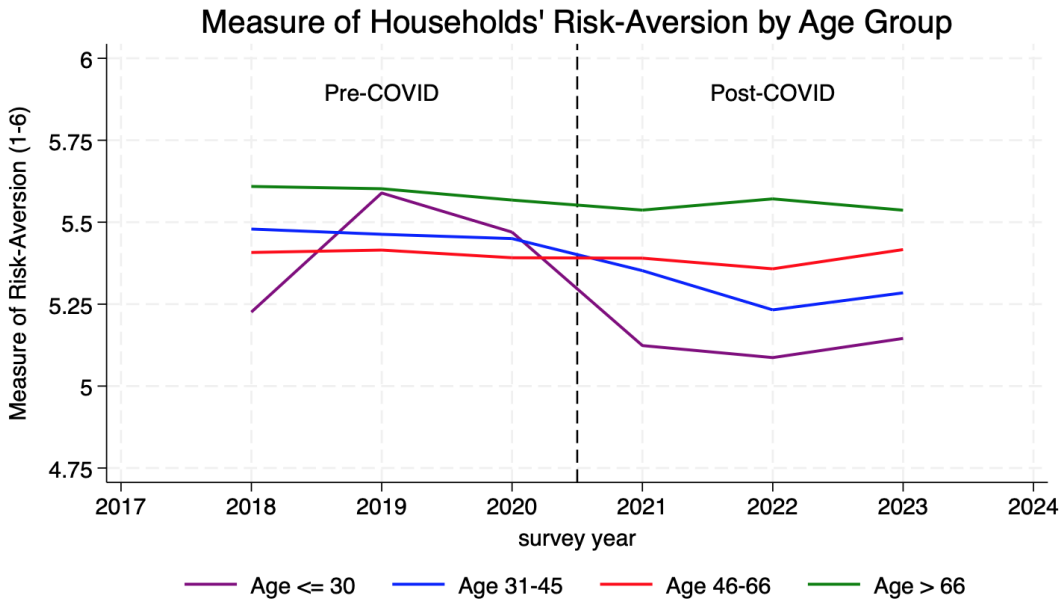
B.3 Breakdown of the Total Financial Assets and Debt Variables

The table below specifies the variables in the DNB Household Survey taken into account to create the total financial assets and debt variables.

Variable	**Definition**
Total Financial Assets	Checking accounts (>0 balance), Saving or Deposit accounts, Deposit Books, Saving Certificates, Single-premium Annuity Insurance Policies, Endowment Insurance, Mutual Funds, Bonds, Shares, Cryptocurrency, Options, Cash at home, Money lent out to family or friends, Employer-sponsored savings plans, Other investments not mentioned before.
Debt	Private loans, Extended lines of credit, Debts/Loans based on hire-purchase, payment by installment and/or a loan or a credit based on collateral, Credit card debts, Loans from family or friends, Student Loans, Debt with mail-order firms, Checking account (<0 balance), Other debt or loans not mentioned before.

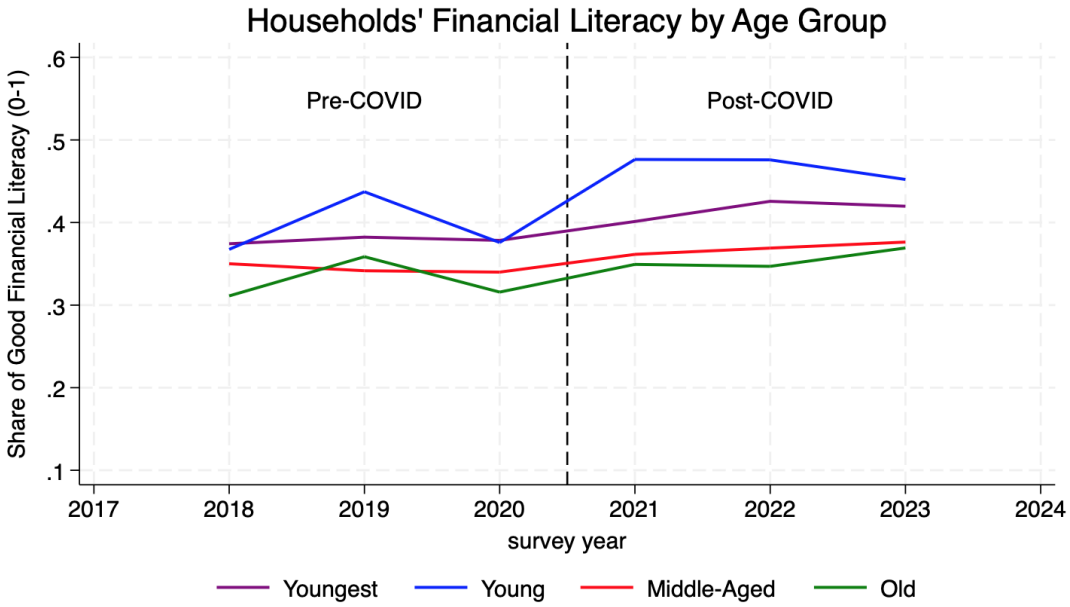
B.4 Mean of risk aversion by age group using DNB Household Survey (2018-2023)

Risk aversion is measured with a scale from 1 (low risk aversion) to 6 (high risk aversion). This figure shows a decrease in the average risk aversion over the years for younger households, that is sustained around the years of Covid-19. Older households appear to have maintained a stable of risk-aversion throughout the years.



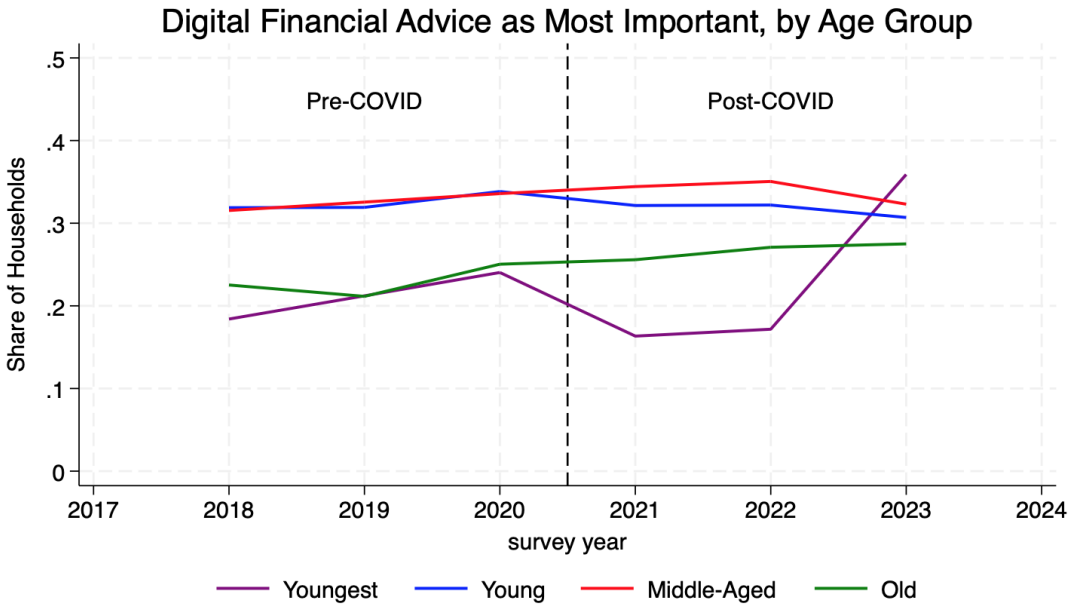
B.5 Financial literacy by age group using DNB Household Survey (2018-2023)

Good_finlit is a dummy variable that is 1 if the reference person of the household reports good or very good level of literacy, and 0 otherwise. This figure shows a general increase in the share of households with good self-reported level of financial literacy after the Covid-19 outbreak. This increase is more pronounced for younger households.



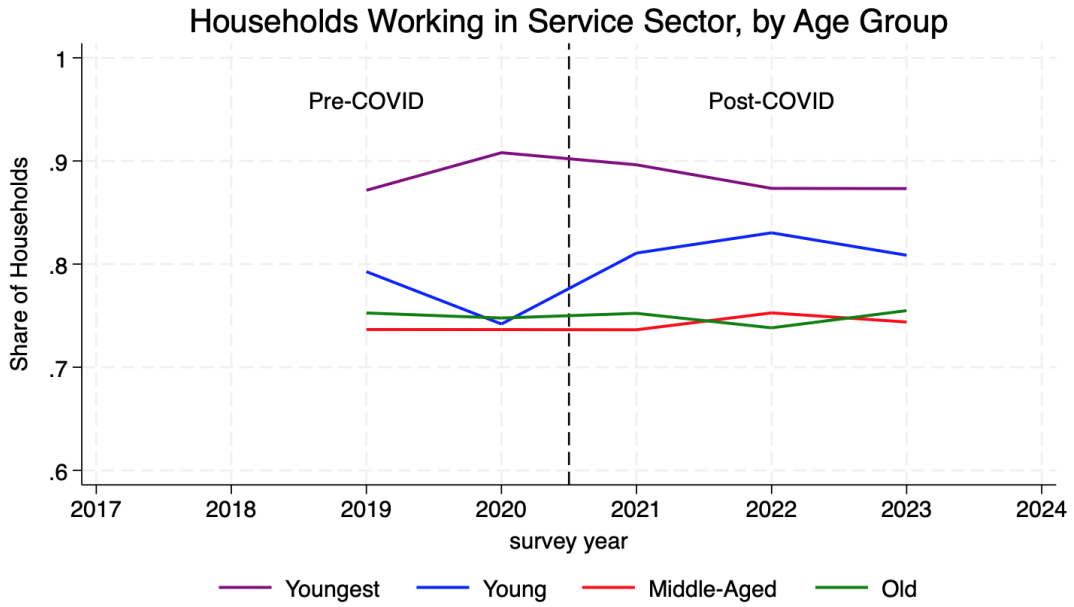
B.6 Digital Advice by age group using DNB Household Survey (2018-2023)

Digital_advice is a dummy variable that is 1 if the reference person of the household reports digital financial advice as the primary source of financial advice, and 0 otherwise. This figure shows substantial variation in the share of households that report digital financial advice as the most important one, especially for youngest households after the Covid-19 outbreak.



B.7 Employment in the service sector by age group using DNB Household Survey (2019-2023)

Services is a dummy variable that is 1 if the reference person of the household is employed in the service sector, and 0 otherwise. Data for this variable is only available from 2019 onwards. This figure highlights significant variation in the share of households employed in the service sector, with younger households representing the largest proportion.



B.8 Summary statistics

This table presents the main summary statistics for the variables employed in the models, using data from the DNB Household Survey (2018-2023). Definitions for all variables are available in subsection A.1. *NOTE: In the models, financial assets and net income are log-transformed. Here, they are shown in their original scale.

	Mean	Std Dev	Percentiles					Obs
			10th	25th	50th	75th	90th	
OwnSTKMF	0.184	0.387	0	0	0	0	1	11,711
OwnSTK	0.100	0.299	0	0	0	0	0	11,711
OwnMF	0.132	0.338	0	0	0	0	1	11,711
Age	56.106	16.434	33	43	57	69	77	14,078
Male	0.682	0.466	0	0	1	1	1	14,078
Hhsize	2.165	1.203	1	1	2	3	4	14,078
College	0.412	0.492	0	0	0	1	1	14,070
Unemp	0.017	0.129	0	0	0	0	0	14,078
Retired	0.289	0.453	0	0	0	1	1	14,078
Financial assets*	52,633.63	260,732.2	892.69	4,474.58	17,780.71	49,822.94	116,733.30	11,037
Net income*	32,481.61	23,898.73	9,882.24	18,240.94	29,201.21	41,856.57	56,617.45	13,194
Health	3.757	0.762	3	3	4	4	5	11,576
Risk_aversion	5.449	0.860	5	5	6	6	6	10,254
Digital_advice	0.295	0.456	0	0	0	1	1	11,223
Good_finlit	0.369	0.483	0	0	0	1	1	12,711
Services	0.763	0.425	0	1	1	1	1	7,75

B.9 Correlation Matrix

This table shows the correlations between the variables included in our models. 4,983 observations are used from the years 2018-2023 of the DNB Household Survey. The natural logarithm of financial assets and risk-aversion have the highest correlations with the dependent variable, ownstkmf. Definitions for all variables are available in subsection A.1.

	ownstkmf	age	male	hhsize	college	unemp	retired	ln_finassets	ln_netinc	health	risk_aversion	digital_advice	good_finlit	services
ownstkmf	1.0000													
age	0.0582	1.0000												
male	0.1456	0.1564	1.0000											
hhsize	-0.0195	-0.2188	0.2197	1.0000										
college	0.1949	-0.1374	-0.0183	0.1018	1.0000									
unemp	-0.0060	-0.0245	0.0060	-0.0570	-0.0541	1.0000								
retired	0.0442	0.7290	0.1357	-0.2215	-0.0560	-0.0954	1.0000							
ln_finassets	0.3741	0.1860	0.1855	0.0751	0.2210	-0.0721	0.1437	1.0000						
ln_netinc	0.1338	-0.1151	0.1257	0.2215	0.2036	-0.0375	-0.0818	0.2489	1.0000					
health	0.0729	-0.1064	0.0418	0.0707	0.1011	-0.0374	-0.0733	0.0991	0.0952	1.0000				
risk_aversion	-0.4427	0.1090	-0.1098	-0.0563	-0.1402	0.0250	0.0932	-0.1884	-0.1332	-0.1050	1.0000			
digital_advice	0.0791	-0.0789	0.1175	0.1089	0.0974	0.0195	-0.0678	0.0433	0.0881	0.0294	-0.0684	1.0000		
good_finlit	0.1843	-0.0656	0.1067	0.1081	0.1716	-0.0261	-0.0105	0.1504	0.1276	0.1149	-0.1383	0.1747	1.0000	
services	-0.0375	-0.0604	-0.2396	-0.1078	0.1492	0.0366	-0.0250	-0.0475	-0.0188	-0.0077	0.0480	-0.0167	0.0599	1.0000

C Results

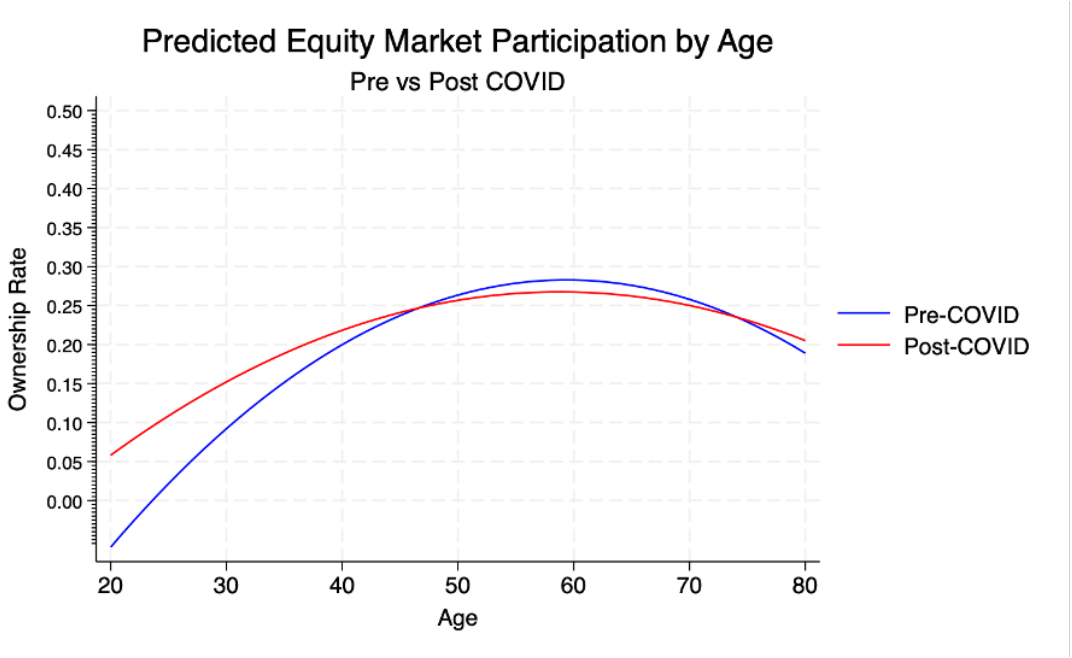
C.1 Linear Probability Model for Total Equity Ownership without Age Cohorts.

The table below reports two specifications using the whole sample from 2018-2023. The dependent variable is the dummy for total equity ownership, ownSTKMF. Households between 46 and 66 years old are the reference group. Fixed effects are accounted for, and p-values are in parentheses. Significant at *10%, **5%, ***1%. Definitions of variables are presented in subsection A.1.

Variables	**(1)**	**(2)**
Constant	−0.351	**−0.633****
	(0.258)	(0.257)
Post-COVID	**0.145*****	**0.283*****
	(0.003)	(0.000)
Age	**0.019***	**0.026*****
	(0.076)	(0.006)
Post-COVID × Age	**-0.005*****	**-0.010*****
	(0.001)	(0.000)
$Age^2 \times 100$	$\mathbf{-1.57e^{-6}}*$	$\mathbf{-2.21e^{-6}}**$
	(0.079)	(0.013)
Post-COVID × $Age^2 \times 100$	$\mathbf{3.90e^{-7}}**$	$\mathbf{8.19e^{-7}}**$
	(0.002)	(0.000)
Male	...	0.029
	(...)	(0.245)
Household Size	...	0.003
	(...)	(0.750)
College	...	**0.087*****
	(...)	(0.006)
Unemployed	...	**0.044****
	(...)	(0.033)
Retired	...	0.003
	(...)	(0.830)
Ln(Financial Assets)	...	**0.020*****
	(...)	(0.000)
Ln(Net Income)	...	−0.001
	(...)	(0.678)
Health	...	0.007
	(...)	(0.128)
Risk Aversion	...	**-0.028*****
	(...)	(0.000)
Observations	11,079	7,753
Adjusted R-squared	0.8414	0.8535
Within R-squared	0.0065	0.0368

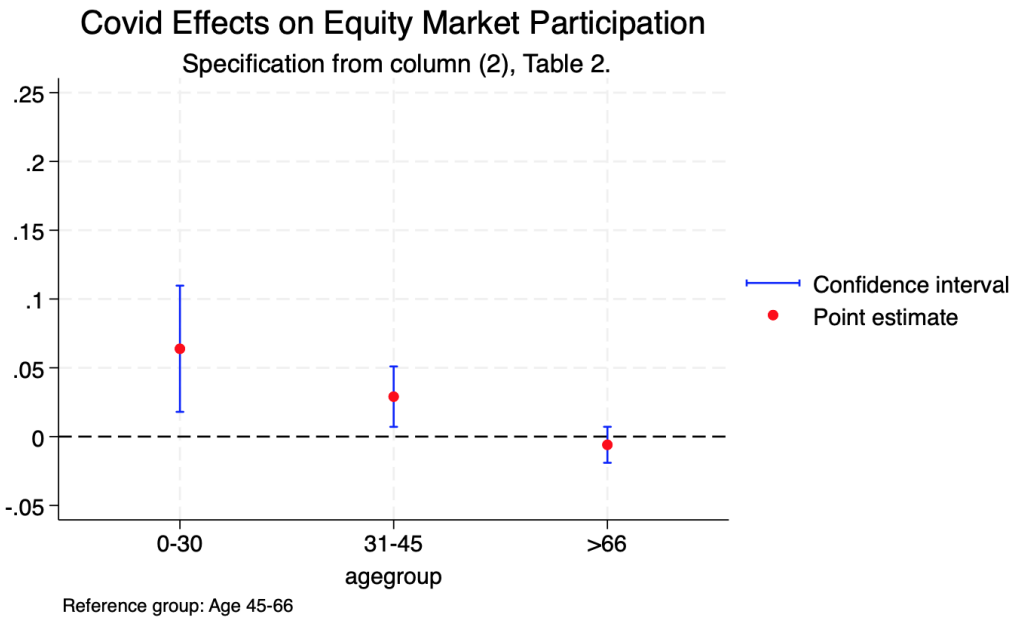
C.2 Relationship between age and ownership of equities created with subsection C.1(2)

The graph illustrates the predicted equity ownership rate by age, comparing pre- and post-Covid periods and controlling for relevant variables, as in subsection C.1 column (2). The hump-shaped relationship between age and equity participation aligns with established findings in the literature. There is a significant increase in the predicted likelihood of equity investment among younger households in the post-Covid. Due to the use of a Linear Probability Model (LPM), some predicted participation rates fall below zero, which should be interpreted as a limitation of the model for low values of age rather than a meaningful outcome.



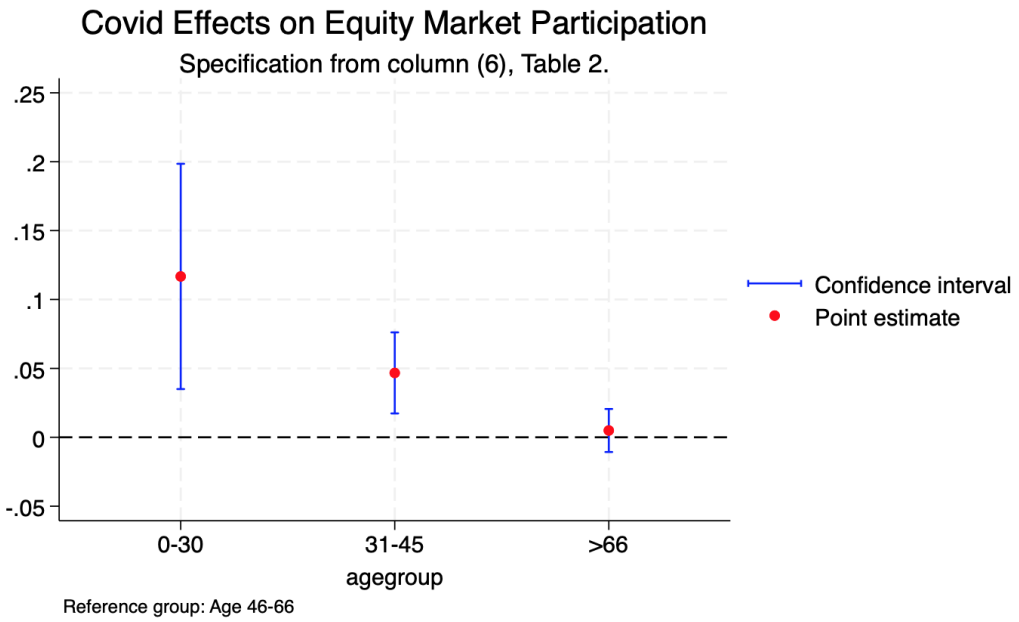
C.3 Coefficient Plot of the Estimates of Table 2 (2) by Age Group Post-Covid.

This coefficient plot is based on a specification without control variables, as shown in column (2) of Table 2. Households between 46 and 66 years old are the reference group, like in the models. The post-Covid point estimates for the three age cohorts analysed are represented, as well as their confidence intervals.



C.4 Coefficient Plot of the Estimates of Table 2 (6) by Age Group Post-Covid.

This coefficient plot is based on a specification with all the baseline control variables, as shown in column (6) of Table 2. Households between 46 and 66 years old are the reference group, like in the models. The post-Covid point estimates for the three age cohorts analysed are represented, as well as their confidence intervals.



C.5 Linear Probability Model for Stock Ownership.

The table below reports several specifications using the whole sample from 2018-2023. The dependent variable is the dummy for stock ownership, ownSTK. Households between 46 and 66 years old are the reference group. Fixed-effects are accounted for, and p-values are in parentheses. Significant at *10%, **5%, ***1%. Definitions of variables are presented in subsection A.1.

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Constant	**0.091*** **	**0.089*** **	**0.053*** **	**0.039***	−0.030	0.057
	(0.000)	(0.000)	(0.006)	(0.077)	(0.450)	(0.290)
Post-COVID	**0.006** **	0.002	0.002	0.002	−0.003	−0.005
	(0.028)	(0.698)	(0.631)	(0.601)	(0.555)	(0.299)
Age ≤ 30	0.011	0.005	0.010	0.011	0.009	−0.027
	(0.650)	(0.837)	(0.700)	(0.662)	(0.749)	(0.313)
Post-COVID × Age ≤ 30	...	**0.081*** **	**0.080*** **	**0.075*** **	**0.102*** **	**0.107*** **
	(...)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)
Age 31–45	0.008	0.002	0.005	0.005	0.0042	−0.013
	(0.481)	(0.863)	(0.684)	(0.631)	(0.749)	(0.306)
Post-COVID × Age 31– 45	...	**0.021** **	**0.020** **	**0.019***	**0.026** **	**0.035*** **
	(...)	(0.029)	(0.038)	(0.052)	(0.022)	(0.009)
Age > 66	0.008	**0.017** **	**0.015***	**0.016***	0.017	0.018
	(0.270)	(0.029)	(0.052)	(0.078)	(0.138)	(0.161)
Post-COVID × Age > 66	...	−0.006	−0.006	−0.006	−0.001	$2e^{-4}$
	(...)	(0.239)	(0.293)	(0.298)	(0.877)	(0.980)
Male	...	...	**0.042*** **	**0.042*** **	**0.052*** **	**0.044** **
	(...)	(...)	(0.003)	(0.003)	(0.001)	(0.011)
Household Size	...	...	0.004	0.003	0.0002	−0.001
	(...)	(...)	(0.637)	(0.672)	(0.983)	(0.926)
College	...	...	...	**0.037***	0.023	0.034
	(...)	(...)	(...)	(0.066)	(0.310)	(0.203)
Unemployed	...	...	...	0.008	0.016	0.020
	(...)	(...)	(...)	(0.520)	(0.299)	(0.161)
Retired	...	...	...	−0.005	−0.013	−0.007
	(...)	(...)	(...)	(0.627)	(0.262)	(0.614)
Ln(Financial Assets)	...	...	...	...	**0.008*** **	**0.008*** **
	(...)	(...)	(...)	(...)	(0.000)	(0.006)
Ln(Net Income)	...	...	...	...	0.001	0.002
	(...)	(...)	(...)	(...)	(0.763)	(0.339)
Health	...	...	...	...	...	−0.005
	(...)	(...)	(...)	(...)	(...)	(0.299)
Risk Aversion	...	...	...	...	...	**−0.014*** **
	(...)	(...)	(...)	(...)	(...)	(0.001)
Observations	11,079	11,079	11,079	11,073	9,657	7,753
Adjusted R-squared	0.8263	0.8272	0.8274	0.8275	0.8383	0.8441
Within R-squared	0.0009	0.0062	0.0078	0.0088	0.0141	0.0179

C.6 Linear Probability Model for Mutual Fund Investment.

The table below reports several specifications using the whole sample from 2018-2023. The dependent variable is the dummy for mutual fund investment, ownMF. Households between 46 and 66 years old are the reference group. Fixed-effects are accounted for, and p-values are in parentheses. Significant at *10%, **5%, ***1%. Definitions of variables are presented in subsection A.1.

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Constant	**0.143*** **	**0.141*** **	**0.101*** **	**0.090*** **	−0.064	0.032
	(0.000)	(0.000)	(0.000)	(0.000)	(0.167)	(0.606)
Post-COVID	0.004	0.002	0.002	0.002	$-4.1e^{-5}$	− 0.002
	(0.189)	(0.736)	(0.622)	(0.650)	(0.993)	(0.663)
Age ≤ 30	−0.018	−0.009	−0.004	−0.004	0.001	−0.017
	(0.476)	(0.726)	(0.878)	(0.893)	(0.981)	(0.544)
Post-COVID × Age ≤ 30	...	0.011	0.009	0.006	0.005	0.020
	(...)	(0.535)	(0.606)	(0.741)	(0.813)	(0.550)
Age 31 – 45	−0.020	**−0.024***	−0.021	−0.021	−0.019	−0.020
	(0.167)	(0.099)	(0.150)	(0.155)	(0.258)	(0.294)
Post-COVID × Age 31 – 45	...	**0.021** **	**0.020** **	**0.019** **	**0.022** **	**0.029** **
	(...)	(0.030)	(0.042)	(0.049)	(0.038)	(0.020)
Age > 66	**−0.022***	−0.016	−0.017	−0.021	**−0.028***	**−0.039** **
	(0.067)	(0.197)	(0.164)	(0.134)	(0.063)	(0.033)
Post-COVID × Age > 66	...	−0.004	−0.004	−0.004	−0.001	0.006
	(...)	(0.530)	(0.568)	(0.593)	(0.851)	(0.508)
Male	...	...	**0.034***	**0.033***	**0.039***	0.028
	(...)	(...)	(0.091)	(0.100)	(0.083)	(0.240)
Household Size	...	...	0.008	0.008	0.006	**0.010***
	(...)	(...)	(0.198)	(0.205)	(0.322)	(0.079)
College	...	...	...	0.025	**0.049*** **	**0.090*** **
	(...)	(...)	(...)	(0.136)	(0.008)	(0.001)
Unemployed	...	...	...	**0.026***	**0.031***	**0.043** **
	(...)	(...)	(...)	(0.066)	(0.052)	(0.037)
Retired	...	...	...	0.009	0.009	0.015
	(...)	(...)	(...)	(0.542)	(0.577)	(0.462)
Ln(Financial Assets)	...	...	...	...	**0.016*** **	**0.017*** **
	(...)	(...)	(...)	(...)	(0.000)	(0.000)
Ln(Net Income)	...	...	...	...	$1.01e^{-4}$	−0.003
	(...)	(...)	(...)	(...)	(0.974)	(0.467)
Health	...	...	...	...	...	0.001
	(...)	(...)	(...)	(...)	(...)	(0.822)
Risk Aversion	...	...	...	...	...	**−0.016*** **
	(...)	(...)	(...)	(...)	(...)	(0.000)
Observations	11,079	11,079	11,079	11,073	9,657	7,753
Adjusted R-squared	0.8154	0.8155	0.8157	0.8157	0.8259	0.8225
Within R-squared	0.0010	0.0020	0.0030	0.0036	0.0124	0.0185

C.7 Linear Probability Model Clustering by Province and Year.

The dependent variables of the specifications are the dummy for ownership of equity, ownSTKMF,(1), stocks, ownSTK, (2), and mutual funds, ownMF, (3). Households between 46 and 66 years old are the reference group. Fixed-effects are accounted for, clustering is applied, and p-values are in parentheses. Significant at *10%, **5%, ***1%. Definitions of variables are presented in subsection A.1.

Variables	**(1)**	**(2)**	**(3)**
Constant	**0.113***	0.083	0.022
	(0.097)	(0.147)	(0.682)
Post-COVID	−0.009	−0.003	−0.004
	(0.154)	(0.647)	(0.450)
Age ≤ 30	**−0.072***	−0.036	−0.028
	(0.078)	(0.153)	(0.420)
Post-COVID × Age ≤ 30	**0.115*****	**0.113*****	0.016
	(0.008)	(0.001)	(0.650)
Age 31 – 45	**−0.052***	−0.021	−0.030
	(0.066)	(0.141)	(0.226)
Post-COVID × Age 31 – 45	**0.043*****	**0.028****	**0.035*****
	(0.003)	(0.045)	(0.008)
Age > 66	−0.015	**0.019***	**−0.036****
	(0.242)	(0.089)	(0.026)
Post-COVID × Age > 66	0.005	0.001	0.007
	(0.548)	(0.938)	(0.423)
Male	0.019	**0.037***	0.016
	(0.517)	(0.084)	(0.556)
Household Size	0.008	0.003	**0.011***
	(0.328)	(0.717)	(0.076)
College	**0.084****	0.031	**0.080*****
	(0.014)	(0.179)	(0.003)
Unemployed	**0.052****	0.026	**0.050****
	(0.038)	(0.136)	(0.026)
Retired	−0.002	−0.006	0.008
	(0.910)	(0.660)	(0.731)
Ln(Financial Assets)	**0.020*****	**0.006***	**0.019*****
	(0.000)	(0.091)	(0.000)
Ln(Net Income)	−0.001	0.002	−0.002
	(0.754)	(0.573)	(0.506)
Health	0.007	−0.004	0.002
	(0.152)	(0.383)	(0.637)
Risk Aversion	**−0.029*****	**−0.014*****	**−0.017*****
	(0.000)	(0.000)	(0.001)
Observations	7,091	7,091	7,091
Adjusted R-squared	0.8550	0.8513	0.8235
Within R-squared	0.0320	0.0166	0.0200