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Determinants of stock market participation

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Abstract

The low degree of stock market participation (SMP) is one of the big puzzles in finance. Numerous determinants have been proposed. We put these determinants into a structure that is derived from a standard static portfolio model. Then we discuss arguments put forward regarding specific SMP determinants and the empirical evidence that has been provided. The focus of our survey is on the identification of a causal impact of determinants on SMP via shocks. We summarize the evidence by suggesting established and likely SMP determinants and providing an outlook for future research and policy.

KEYWORDS

information, return volatility, risk tolerance, stock market participation, transaction costs

JEL CLASSIFICATION

G 11 (portfolio choice), G 51 (household saving)

1 | INTRODUCTION

Investing in stock markets typically yields substantial returns, evident in the historical performance of the S&P 500, which averaged a remarkable 12.5% annual return between 1974 and 2023. In contrast, a risk-free investment in US 3-month treasury bills offered returns of only 4.4%. Accordingly, rational investors with a long-term horizon should allocate a significant portion of their available funds to these markets and less to other forms of savings. The reality, however, is quite different. Most individuals—and in many countries even more than 90% of adults—do not

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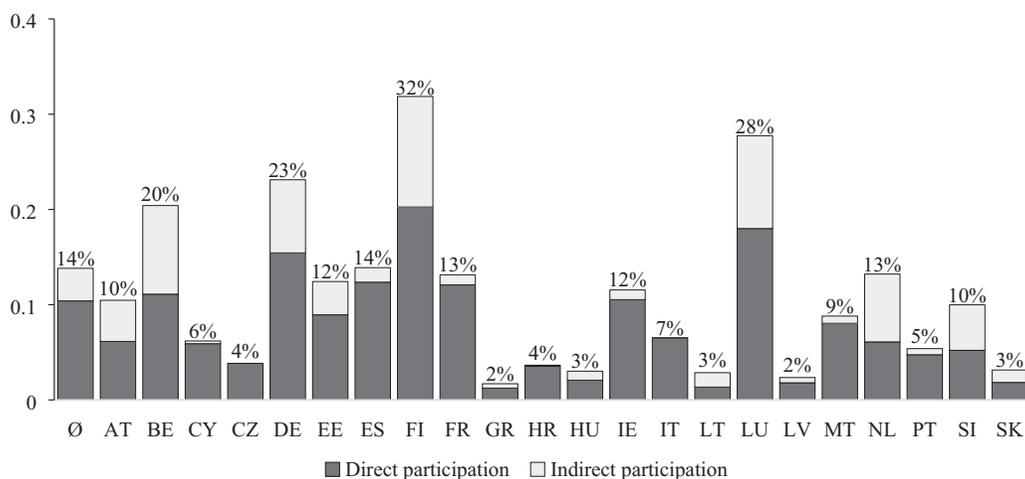


FIGURE 1 Direct and indirect stock market participation by country. The figure illustrates the proportion of the adult population in each country who have made investments in stocks in the year 2021. The lower segments of the stacked bars represent the percentage of the population who have at least directly invested in stocks (they may have invested in equity funds as well), while the upper segment represents those who have invested in equity funds but not in individual stocks. Both combined show the total participation per country. Country abbreviations are: *AT* for Austria; *BE* for Belgium; *CY* for Cyprus; *CZ* for Czech Republic; *DE* for Germany; *EE* for Estonia; *ES* for Spain; *FI* for Finland; *FR* for France; *GR* for Greece; *HR* for Croatia; *HU* for Hungary; *IE* for Ireland; *IT* for Italy; *LT* for Lithuania; *LU* for Luxembourg; *LV* for Latvia; *MT* for Malta; *PT* for Portugal; *SI* for Slovenia; *SK* for Slovakia. \emptyset refers to the full sample. Estimated using survey weights and multiple-imputation techniques. Data source: HFCS 2021.

invest in stocks or other assets containing stocks, such as public investment funds. This is illustrated by Figure 1, which shows the degree of stock market participation (SMP) for 22 European countries in 2021, compiled by domestic authorities in exactly the same way. If one considers direct holding of stocks only, the degree of SMP varies between 1% and 20%; if one considers holdings of stocks via investment funds as well, the degree of SMP varies between 2% and 32%. Looking at all 22 countries, 10% of the population hold stocks directly and 14% participate in the stock market (SMP increased by three percentage points since 2017, see Appendix Figure A1, Table A1). Whether the degree of SMP is 10% or 14%, this low degree cannot be easily explained by risk aversion, liquidity demand or transaction costs. Therefore, it is regarded as a puzzle, the SMP puzzle.

While SMP may be viewed superficially as an issue that only interests investment advisors and relatively wealthy people, this perspective is fundamentally flawed. In fact, the gains from holding risky assets, such as stocks, are not randomly distributed across society but are concentrated among those who are already financially well-off (Bach et al., 2020). In this sense, the high returns from SMP contribute to perpetuating or even amplifying wealth and income inequality, while inequality is often seen as one of the major problems of current societies (Kuhn et al., 2020). Going further, the research on SMP shows that it is partially shaped by determinants that can be influenced by policy. Therefore, the current state of SMP is not just of concern to policy, but policy could act on it and reduce this concern.

Due to its fundamental nature, persistence and potential distributional consequences, the SMP puzzle has attracted a huge body of thorough research. Accordingly, this research has been covered in many surveys; however, these surveys typically address a broader topic than just SMP, that is,

mainly household finance, such as Campbell (2006), Guiso and Sodini (2013), or Gomes et al. (2021). Thus, these surveys leave room to delve deeper into SMP, and the more recent these broader surveys are, the larger is the wealth of literature to be considered and the less they can say about the research on SMP (such as just section 2.3 in Gomes et al., 2021). Thus, we believe there is demand for a new survey with a specific focus on two aspects: first, the survey is limited to SMP and its determinants only, and second, it emphasizes the empirical literature since the 2010s with a focus on establishing causality. This allows us to derive established facts of SMP determinants, which are well identified and robust across multiple studies.

Thus, our survey first structures the literature by relying on a standard approach on diagnosing the share of stocks in an optimal portfolio. This structure is applied to a discussion of research introducing SMP determinants, which often stems from the 2000s. Many of these studies run OLS- or Probit-regressions, often assuming (or explicitly addressing) that the growing list of potential SMP determinants is exogenous. This is quite obvious for individual characteristics, such as age, gender, or race but it is much less clear for others, such as wealth or income. Consequently, the later phase of research, that is, since the 2010s, addresses this methodological limitation; this research is often made possible by the availability of new data. Thus, more recent research is typically characterized by a concern about clear identification, and this leads to studies analyzing the impact of exogenous shocks on SMP. These results help shape the set of well-identified SMP determinants.

According to the content outlined above, this paper is organized in five sections. Section 2 derives the structure of SMP determinants, and Section 3 discusses studies introducing a large set of SMP-determinants. Research focusing on the identification of SMP determinants via shocks is covered in Section 4. Finally, Section 5 takes stock of findings and concludes.

2 | STRUCTURING THE SET OF POTENTIAL SMP-DETERMINANTS

There is no generally established structure of SMP-determinants in the literature. Thus, we take a widely accepted model to derive the optimal share of risky assets as the starting point. Then, we allocate main SMP-determinants to this structure.

2.1 | The optimal share of stock holdings

Investors face the decision of allocating their wealth between risky and risk-free assets to maximize the expected utility of consumption over time. This is modeled in a standard static portfolio model that incorporates the two types of assets, where we equalize risky assets with stock holdings, and power utility preferences (see, e.g., Campbell & Viceira, 2002, pp. 17–47). These preferences imply absolute risk aversion to decline in wealth, while relative risk aversion remains constant, features that seem quite realistic (while other portfolio choice models such as a model with constant absolute risk aversion yield the same results, the provided model is most commonly used in nowadays literature). Assuming concretely that the investor has constant relative risk aversion (CRRA) preferences and utility is defined over wealth, the maximization problem can be expressed as follows:

$$\max_{\alpha} E_t \left[\frac{W_{t+1}^{1-\gamma}}{1-\gamma} \right] \quad (1)$$

subject to the budget constraint

$$W_{t+1} = [1 + (\alpha R_{t+1} + (1 - \alpha) R_{f,t+1})] W_t, \quad (2)$$

where W_t is wealth in period t , γ is the coefficient of relative risk aversion, R_{t+1} and $R_{f,t+1}$ are the returns on the risky and the risk-free asset, respectively, and α is the share invested in the risky asset. Under the assumption that returns and wealth in the next period are lognormal, the maximization problem can be rewritten as

$$\max_{\alpha} E_t r_{p,t+1} + \frac{1}{2} (1 - \gamma) \sigma_{pt}^2, \quad (3)$$

where $r_{p,t+1} = \log(1 + (\alpha R_{t+1} + (1 - \alpha) R_{f,t+1}))$ is the log return on the portfolio and σ_{pt}^2 is the conditional variance. Using a Taylor approximation, the problem becomes

$$\max_{\alpha} \alpha (E_t r_{t+1} - r_{f,t+1}) + \frac{1}{2} \alpha (1 - \alpha) \sigma^2 + \frac{1}{2} (1 - \gamma) \alpha^2 \sigma_t^2 \quad (4)$$

and the solution is

$$\alpha = \frac{E_t r_{t+1} - r_{f,t+1} + 1/2 \sigma_t^2}{\gamma \sigma_t^2}. \quad (5)$$

The optimal share invested in the risky asset or stocks, α , is positively correlated to the excess expected return of the risky asset, the equity premium, and negatively related to the variance σ_t^2 and the coefficient of relative risk aversion γ . Accordingly, if the expected return on stocks is larger than the return on the risk-free asset, the optimal share invested in stocks must be greater than zero and individuals should always be willing to invest at least a small proportion of wealth in stocks. The contribution of SMP, or the proper increase in SMP, to individual welfare is discussed in Brennan and Torous (1999) by making plausible parameter assumptions and simulating the consequences of the degree of SMP.

Despite the prediction of the standard static portfolio model, which suggests households should invest at least a small portion of their wealth in stock markets, empirical studies have consistently shown that a considerable proportion of households, and even the large majority in most countries, does not participate in the stock market. Even if we consider that a large share of households does not own sizable financial assets to be invested, the majority and even a large share of wealthy households does not own stocks. Thus, there is this SMP-puzzle to be understood.

2.2 | Overview about groups of determinants

There are of course various ways to structure the potential determinants of SMP. We propose to take here Equation (5) as the starting point, because this links the derivation of “optimal” behavior directly to its violations and to the discussion why SMP is often so small. This procedure leads to three groups of determinants: the excess return of stocks (over riskless assets), the volatility of stock returns and the individual risk aversion (Figure 2). We add to the three above mentioned groups of determinants a fourth group, considering approaches built on non-standard risk preferences of individuals. All determinants being discussed in the literature can be systematically

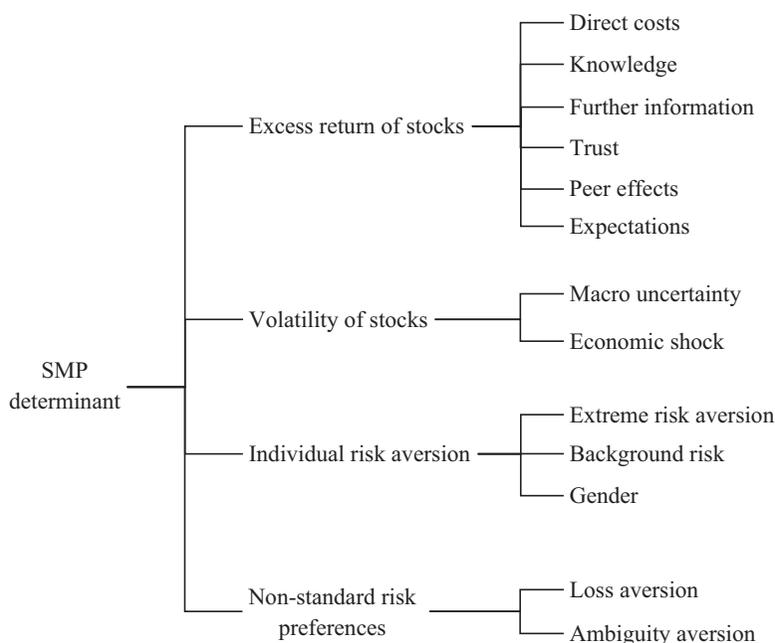


FIGURE 2 Determinants of stock market participation.

allocated to this structure. In some cases, this is straight forward, in other cases the allocation is less obvious, indicating the limitations of this structuring. Then, we focus for our classification decision on the most important relation. For example, a large body of research is about the participation cost in stock markets which is not by itself one of the three groups of determinants introduced above; however, participation costs reduce returns, so that we will treat them accordingly as a negative impact on returns. We therefore discuss the determinants of SMP in more detail.

The research focus has been on the first group, that is, the excess return of stocks (see Figure 2). Here, we distinguish six subgroups of arguments: (i) the direct costs that come with investing in stocks (and may be too high for some), (ii) the knowledge about SMP in general and the size of these excess returns specifically, (iii) further kinds of information costs about SMP, (iv) trust into the institutions of society, such as the financial system, which may contribute to positive expected outcomes of SMP, (v) peer effects which may ease SMP, and finally (vi) the formation of expectations about (excess) returns in the nearer future which may be influenced by individual characteristics, such as optimism.

The second group of determinants, addressing the time-varying volatility of stock returns, has been less covered in the literature. Arguments put forward why stock return volatility may hinder individuals from SMP refer to (i) macro uncertainty as more uncertainty may increase the desire for stable returns and thus less stock holdings and to (ii) specific economic shocks, such as a financial crisis, which reduce income, increase uncertainty and may also increase fears about tail risks and thus reduce the willingness of SMP.

The third group of determinants refers to individual risk aversion. It seems possible that (i) the individual degree of risk aversion is so high that SMP will be marginal and in combination with some participation costs may never occur, (ii) that background risk will lead to a cautious view

on stock holdings, and (iii) that gender plays a role if less risk-tolerant women participate less in stock markets.

Finally, the fourth group of determinants argues that some individuals have non-standard risk preferences which make the volatile, uncertain stock returns unattractive, such as (i) loss aversion or (ii) ambiguity aversion.

3 | STUDIES ADDRESSING THE MAIN DETERMINANTS

The literature on SMP gained momentum in the 1990s and reached a level of saturation during the 2000s. At that time, the main determinants of SMP had been uncovered and analyzed mainly in regression form, often assuming that determinants can be largely regarded exogenous or accepting that better data testing causality are not available. Representing this situation, we refer to the widely cited study by Hong et al. (2004) in Section 3.1. Thereafter, we introduce and discuss further important studies in Section 3.2 and summarize the status in Section 3.3.

3.1 | A standard set of individual characteristics

The study of Hong et al. (2004) is among the most influential works on SMP with more than 2.300 google citations by 2023, which are increasing per year until 2022. While this study is famous because of its early consideration of “social interaction” generally and in the SMP-literature specifically, the set of (control) variables explaining SMP represents the state of the art at that time. Hong et al. (2004) analyze data from the Health and Retirement Survey, mainly using the wave of 1992 where a household member was born between 1931 and 1941, implying that this dataset is not representative for the entire adult population (Dierkes et al. (2011) show in a replication with representative data from Germany that the effect of sociability is even stronger for individuals younger than 50 years). They cover about 7500 households with an average age of 56 years.

They find using OLS-regressions that more household wealth, better education and lower risk aversion are important drivers to increase SMP. Referring to the structure of SMP-determinants as shown in Figure 2, these three variables cover direct costs, knowledge and risk aversion. Hong et al. (2004) also add income as a related aspect to wealth, and a set of variables mainly capturing aspects of information costs: race, where they distinguish between white (and non-Hispanic) versus others, age, urban versus rural, gender, marital status and state dummies. Of these variables, they show coefficients for “white” (race) and “urban” which are both positive and significant. The coefficients on age are not significant, and the three other variable coefficients (gender, marital status, state dummies) are not shown, indicating their minor relevance.

Among information costs, Hong et al. (2004) introduce three variants of a sociability indicator, that is, know neighbors, visit neighbor, or attend church. Each variant has statistically highly significant positive coefficients. As sociability may be related to optimism and openness, they also introduce respective control variables (as good as their data offer variables) which they label “depressed” and “low tech,” and indeed these variables are also significant but do not outweigh sociability.

Overall, Hong et al. (2004) confirm for their data the important and quite robust role of wealth, education, risk aversion and newly “sociability” as SMP-determinants, but also further aspects of information costs, that is, race, living in an urban area, as well as optimism and openness. Relative to these variables, income (in addition to wealth), age, gender, marital status and state appear to be less important, either because coefficients are insignificant or not shown.

TABLE 1 Overview SMP-determinants referring to excess return of stocks.

Category	Characteristic	Studies
Direct costs	Wealth	Bertaut and Haliassos (1995)
	Income	Guiso et al. (2003)
	Transaction costs	Vissing-Jørgensen (2002)
Knowledge	Education	Bertaut and Haliassos (1995)
	Cognitive abilities	Christelis et al. (2010), Grinblatt et al. (2011)
	Type of education	Christiansen et al. (2008)
	Occupation	Vaarmet et al. (2019)
Further information	Financial literacy	van Rooij et al. (2011)
	Cultural background	Hong et al. (2004)
Trust	Age	Bertaut (1998), Ameriks and Zeldes (2004)
	Individual trust level	Guiso et al. (2008)
Peer effects	Regional trust level	Georgarakos and Pasini (2011)
	Sociability/neighbors	Hong et al. (2004), Brown et al. (2008)
	(Social) groups	Georgarakos and Pasini (2011), Changwony et al. (2015)
	Coworker	Hvide and Östberg (2015)
Expectations	Parents	Black et al. (2017), Knüpfer et al. (2023)
	Optimism	Hurd et al. (2011)
	Experiences	Malmendier and Nagel (2011)
	Political orientation	Kaustia and Torstila (2011)

3.2 | Studies emphasizing specific determinants

We structure the studies on SMP-determinants into four main groups, that is, excess return of stocks, volatility of stocks, individual risk aversion, and non-standard risk preferences, each presented in one of the Sections 3.2.1–3.2.4. Within each of the three groups we follow the sub-groups as shown in Figure 2, and delving deeper we address the third level of this structure which has been just mentioned in Section 2.2. Here we introduce at least one representative study for each of the SMP-determinants put forward at this disaggregated level. Unfortunately, the wealth of studies does not allow to cover them comprehensively but we need to be very selective.

3.2.1 | SMP-determinants referring to excess return of stocks

Direct costs

Regarding direct costs of holding and transacting stocks, the main argument made is that there is a kind of minimum fixed costs for SMP to be covered. This is demonstrated by Vissing-Jørgensen (2002) who finds that per period stock market participation costs of just USD 50 are sufficient—under certain assumptions—to explain why half of non-stockholders in the U.S. do not participate. Accordingly, higher wealth and also higher income (which are positively related to each other) are a prerequisite to cover these costs and thus make it a crucial determinant of SMP as early shown by Bertaut and Haliassos (1995) and being confirmed in many more studies (e.g., Guiso et al., 2003) (see our Table 1). Wealth is even more important due to another effect we had mentioned in

Section 2.1 above, that is, because the level of risk aversion tends to decrease with higher wealth (Cohn et al., 1975; Riley & Chow, 1992) which results in wealthier households allocating more funds to risky assets. However, it seems noteworthy that even among wealthy households many do not invest in stocks as shown, for example, by Guiso et al. (2003) comparing SMP across the U.S. and eleven European countries with participation rates in the 95th wealth percentile ranging from 25% in Spain to 96% in Sweden.

Direct cost may hinder SMP less severely, if these costs decrease. Their burden becomes lighter with higher wealth but also when costs decrease outright. This latter effect has been shown with the introduction of the internet, as we will discuss in Section 4 below (Bogan, 2008).

Knowledge

Another important characteristic easing access to SMP is knowledge and the most general measure of knowledge is the degree of education. Haliassos and Bertaut (1995) use data from the 1983 Survey of Consumer Finances (SCF) and find that households with college education are more likely to participate in the stock market than those who received no college education, which is confirmed by subsequent studies (Bertaut, 1998; Guiso et al., 2003). Possible channels through which education influences SMP are manifold. Higher education should lead to reduced information costs, which is often seen as the main argument. Higher education may also lead to higher wealth, less risk aversion, and finally more SMP.

A related argument is made for an individual's cognitive ability. Christelis et al. (2010) find that the propensity to invest in stocks is strongly associated with cognitive ability while at the same time the effect of cognition on holding other, less information-sensitive assets such as bonds is substantially weaker. These findings suggest that the relationship between SMP and cognitive ability is driven by information constraints. Grinblatt et al. (2011) support these results by demonstrating a monotonic relationship between IQ and SMP, highlighting the lack of cognitive skills as a fundamental driver of nonparticipation. Moreover, in their study the impact of IQ on participation between affluent and non-affluent individuals is very similar, proving that wealth and direct participation costs cannot fully account for nonparticipation. The results by Grinblatt et al. (2011) are especially convincing, since they do not rely on survey data, but on IQ scores for Finnish males in a 20-year age range, which are obtained upon induction into Finland's mandatory military service and on direct ownership records of Finnish stocks plus all foreign stocks traded on the Helsinki Exchanges. In addition to the explanation of information constraints, Dohmen et al. (2010) find that lower cognitive ability is associated with greater risk aversion, so that cognitive ability may have further additional positive effects on SMP.

As shown by Christiansen et al. (2008) it is not just the degree of education that matters, but also the type of education received. They find that the probability of participating in the stock market increases after an investor completes an economics education. This could be explained by the fact that economists should be better able to gather and understand information about stock markets, reducing their participation costs. In line with that argument, Grinblatt et al. (2011) and especially Vaarmet et al. (2019) demonstrate that households' occupations matter as well: an occupation in the financial industry increases the probability of SMP.

As a specific form of economics knowledge, financial literacy has been investigated as a SMP-determinant. Van Rooij et al. (2011) find that households with low financial literacy are much less likely to invest in stocks which could be explained by increased indirect participation costs: acquiring knowledge about financial markets and instruments is costly. Accordingly, improving financial literacy could be one tool to increase SMP as shown by Bernheim and Garrett (2003), who argue that financial education at work significantly increases the probability of retirement saving

among low and moderate savers. Bernheim et al. (2001) provide evidence that state-wide high school financial curriculum mandates significantly raise asset accumulation of students when reaching adulthood. However, Cole and Shastry (2014) find that while higher education increases SMP, the high school financial literacy programs they cover do not affect participation.

Further information

A third group of variables addresses further information that individuals may have about SMP (beyond the knowledge variables discussed above), but the exact mechanism of how such information impacts SMP is sometimes unclear. For example, Hong et al. (2004) find, individuals with specific cultural background (white race without Hispanics) or those living in urban areas may find it easier to hold stocks. This holds while controlling for wealth, income, education, etc., so that the difference between groups may be something as the acquaintance with stocks or exposure to information about stocks.

Age also plays a crucial role in SMP. Older investors acquire information over time and are therefore more likely to hold stocks as Bertaut's (1998) analysis of SCF data from 1983–1989 shows. However, identifying the precise effect of age is challenging due to the interplay of cohort, time, and age effects. Ameriks and Zeldes (2004) present diverse findings based on different identification assumptions, suggesting that stock market participation either increases steadily until retirement and remains stable thereafter or remains relatively stable until retirement and then decreases. This largely fits to a recent study by Gomes and Smirnova (2022) who find that SMP is a hump-shaped function of age, increasing early in life, flattening around mid-life, and, finally, decreasing as individuals approach retirement and again during retirement.

Trust

Another strand of literature has emphasized the role of trust. Trust, defined by Guiso and Sodini (2013, p. 1457) as confidence in “information sources, financial advisors, portfolio managers, and, more generally, on the overall reliability of the financial system” positively affects the expected return of an investment and, consequently, the investment decision including SMP. An important study on the effect of trust on SMP at an individual and cross-country level is conducted by Guiso et al. (2008). They show that many households, especially financially illiterate households, lack sufficient trust to participate in stock markets, with trust levels determined in part by objective characteristics of the financial system (e.g., investor protection rules) but also by subjective characteristics of the individual, leading to differences in trust levels across individuals but also across regions. Georgarakos and Pasini (2011) build on this research and find that an affluent household living in a low-trust region in Europe and moving to a higher-trust region will almost double the probability of SMP.

Peer effects

Moreover, peer effects matter, as individuals with more and specific social interaction have better access to the stock market. As discussed above, Hong et al. (2004) investigate the likelihood of SMP given an investor's sociability and find that SMP is higher among individuals that entertain intense social interactions compared to “non-socials.” This is confirmed by Brown et al. (2008) who approximate an influence from peer effects as the likelihood of households being asked for advice by their neighbors. Georgarakos and Pasini (2011) who use SHARE data approximate peer effects as being active in a social group, such as charity work group, training course, sport club, community organization, etc. Moreover, Hvide and Östberg (2015) find a positive correlation of stock market investment decisions among coworkers. A related role may be played by parents,

as Black et al. (2017) show that there is a positive relation of SMP across generations and that this effect also holds for adoptees (i.e., ruling out a strict biological explanation). This is confirmed by Knüpfer et al. (2023) in a different approach, emphasizing, among others, the role of communication. Changwony et al. (2015) findings align with the broader notion of peer effects' importance but provide a nuanced perspective: while conversations with neighbors don't seem to impact SMP, active participation in social groups does. Overall, the effect of peer effects could be explained by information spillover from informed investors to less informed, reducing participation costs for uninformed, but social investors. An alternative explanation is that individuals may enjoy discussing investment decisions with their peers which leads to an increasing likelihood of SMP.

Expectations

Finally, higher return expectations regarding stocks will increase, c.p., SMP. Hurd et al. (2011) find that individuals' expectations about the rate of return of the Dutch stock market are much lower compared to historical returns. In the presence of a lower expected equity premium, participation becomes loss probable. Additionally, they find that more optimistic individuals are more likely to be stockowners due to the higher expected equity premium. A step further goes the analysis of Das et al. (2020) who show that expectations, regarding several fields including stock markets, are systematically more optimistic for those with a better socio-economic status.

While there are differences in return expectations across individuals, there are also cohort effects. Malmendier and Nagel (2011) analyze the effect of early experiences, here the depression of the 1930s, for later decisions, such as a lower degree of SMP. Obviously, such experiences can affect decision making over long horizons.

Some studies show that the political orientation of individuals may play a role for the decision to hold stocks. Kaustia and Torstila (2011) find that more right-wing oriented people are more open to SMP, while some left-wing people seem to refuse SMP. One channel to explain this behavior may be higher return expectations of right-wing investors. Following this argument, Meeuwis et al. (2022) show that likely-Republicans increased their stock investments following the 2016 U.S. presidential election, while likely-Democrats rebalanced into safe assets.

3.2.2 | SMP-determinants referring to the volatility of stocks

Macro uncertainty

More recently, studies analyze the negative role of macro uncertainty for SMP, as uncertainty means a more volatile environment where also volatility of stock returns may increase (and / or risk premia increase). Agarwal et al. (2022) find that political uncertainty decreases SMP to a significant extent (see in the following also Table 2). With increasing uncertainty, households reallocate their investments from stocks or other risky assets to safer assets such as currency and deposits. The mechanism by which political uncertainty affects SMP is via increased labor income risk and increased asset valuation risk which is especially binding for less wealthy and low-income households.

Economic shocks

Economic shocks, in particular more severe crises, such as the Great Financial Crisis of 2008/09, reduce wealth and income of most households and at the same time increase uncertainty and possibly also tail risk. Complementing these general effects, studies also analyze specific mechanisms,

TABLE 2 Overview of SMP-determinants referring to stock volatility, risk aversion and non-standard preferences.

Category	Characteristic	Studies
Panel A: Volatility of stocks		
Macro uncertainty	Political uncertainty	Agarwal et al. (2022)
Economic shock	Financial crisis	Chen and Stafford (2016)
Panel B: Individual risk aversion		
Background risk	Labor income risk	Bertaut and Haliassos (1995), Heaton and Lucas (2000)
	Homeownership	Cocco (2005), Vestman (2019)
	Health	Rosen and Wu (2004)
	Marital status	Love (2010)
Gender	Gender	Croson and Gneezy (2009), Halko et al. (2012), Almenberg and Dreber (2015)
Panel C: Non-standard preferences		
Loss aversion	Loss aversion	Gomes (2005), Dimmock and Kouwenberg (2010)
	Myopic loss aversion	Benartzi and Thaler (1995)
	Narrow framing	Barberis et al. (2006), Calvet et al. (2023)
	Disappointment aversion	Ang et al. (2005)
Ambiguity aversion	Ambiguity aversion	Dow and Werlang (1992), Dimmock et al. (2016)

such as Chen and Stafford (2016) who look at stock ownership of families with mortgages in the U.S. in 2007–2009. They find that families experiencing mortgage payment difficulties during the financial crisis more likely drop out of the stock market. Moreover, families who sold their stock holdings before the crisis are less likely to participate again in the subsequent years indicating an effect similar to Malmendier and Nagel (2011).

3.2.3 | SMP-determinants referring to individual risk aversion

High risk aversion

On the way to solving the SMP-puzzle, researchers have experimented with several forms of utility functions and the role of risk, but the level of risk aversion required to explain non-participation in the real world is unrealistically high. However, in the presence of some form of participation costs, extremely high levels of risk aversion can serve as an explanation for non-participation. For the overwhelming majority, however, high risk aversion does not singularly hinder SMP.

Background risk

The literature addressed background risk early on, because the volatility of stocks may hinder SMP, if the individual is plagued with more risks in other circumstances of life. Haliassos and Bertaut (1995) find a negative correlation between stock market participation and the risk of unemployment which translates into income risk. The higher the risk of unemployment, the lower the probability of holding stocks (for an overview of studies see Table 2). Similarly, Heaton and Lucas

(2000) find a negative correlation between entrepreneurial risks and SMP: households with high and variable proprietary business income hold less wealth in stocks than other similarly wealthy households. Another example of background risk is homeownership. Cocco (2005) finds that investing in housing leads to limited financial wealth to invest in stocks for younger and poorer individuals and thus less SMP. Furthermore, the study indicates that house price risk adversely affects SMP for both high and low net-worth investors. Vestman (2019) compares the SMP of homeowners and renters, and finds that the substitution between homeownership and stocks is less important than the general preference to save, and thus to own assets or not. Other forms of background risk being empirically examined are poor health (see Rosen and Wu (2004)) which may cause unpredictable health costs or the marital status (see Love (2010)) because responsibility for other persons, in particular children, does not allow to invest in assets with quite volatile income streams.

Gender

The fact that women participate on average less often in the stock market compared to men, the gender investing gap, has gained notable attention in both popular press and academia. An important role for explaining the gap plays risk aversion. Many studies, such as Croson and Gneezy (2009), show that women are, on average, more risk averse than men. Accounting for risk attitudes alone already explains a large part of the gender gap, as shown for example by Fey et al. (2020). Further studies, such as Almenberg and Dreber (2015), argue that, in addition to risk aversion, differences in financial literacy help to explain the gap which is supported by Dweyer et al. (2002) and Bucher-Koenen et al. (2021). Niessen-Ruenzi and Mueden (2023) show that gender-specific financial socialization may also play a role. Nevertheless, a residual gender gap in participation persists even when accounting for these variables. Interestingly, a few studies conducted in relatively gender-equal countries do not find a relation between SMP and gender, such as in Finland (Halko et al. (2012)) or Thailand (Grohmann et al. (2021)), indicating that social norms play a role for SMP (Ke, 2018).

3.2.4 | SMP-determinants referring to non-standard risk preferences

Loss aversion

A theoretical explanation for non-participation can be non-standard preferences of individuals. While common preference specifications such as the demonstrated CRRA preferences lead to SMP, non-participation can be the utility maximizing choice for individuals with loss-aversion. This implies that individuals frame events either as gains or losses relative to a reference point, and weight losses more heavily than gains. In a theoretical framework, Gomes (2005) shows that loss averse investors tend not to hold stocks or invest only a much smaller fraction of their wealth in the stock market compared to investors with standard preferences. This is supported by Dimmock and Kouwenberg's (2010) empirical study. Benartzi and Thaler (1995) argue that especially myopic loss aversion is contributing to non-participation. That is, investors are evaluating their portfolios frequently and appear to choose portfolios as if they were operating with a time horizon of about 1 year even though their investment objectives are long-term which makes non-stock investments more appealing.

Barberis et al. (2006) show that narrow framing of individuals with loss aversion contributes to the decision to stay out of the stock market. Narrow framing occurs when an agent evaluates a risky investment decision in isolation without considering other risks already taken (Barberis

et al., 2006). In deciding to invest in the stock market, the potential investor evaluates only the potential gains or losses from this singular investment, when in fact it affects the investor's overall welfare and could serve as a hedge against preexisting risks such as labor income risk.

Empirical evidence is provided by Calvet et al. (2023) who analyze in Sweden the impact of capital guarantee products compared to other financial products such as exchange-traded funds (ETFs). They show that preferences combining loss aversion and narrow framing serve as an explanation of low levels of household risk-taking and that, given the preferences, capital guarantee products increase financial risk-taking, explaining the rapid adoption of the product.

Similar to loss aversion, Ang et al. (2005) show that disappointment aversion might explain non-participation; individuals who are disappointment-averse are particularly concerned about outcomes falling short of what they had hoped for or anticipated which explains, for example, why such agents participate in lottery gambles but not in the stock market.

Ambiguity aversion

Moreover, ambiguity is an important determinant limiting SMP. In a theoretical framework, Dow and Werlang (1992) show that when faced with ambiguous probabilities and limited information about stock returns, ambiguity averse investors may opt for non-participation as the utility maximizing decision to avoid the discomfort and anxiety associated with uncertainty. This is supported by Dimmock et al. (2016) who analyze a representative survey sample of U.S. households. Their result indicates that SMP decreases when ambiguity aversion increases.

3.3 | Multi-country evidence about SMP-determinants

To reveal a set of stylized determinants of SMP, one would ideally need SMP-regressions with many samples and always using the same set of variables. The literature is quite different although, papers usually relying on specific samples, usually from single countries, and specific data, covering diverse sets of SMP-determinants. Still, there are a few studies applying a unified (although specific) set of SMP-determinants to a group of countries. These studies provide first insights about determinants which seem to be robust to country-specific institutional variation. We shortly report on the results of four such studies.

An early contribution is Guiso et al. (2003) who analyze SMP in six European countries and the U.S., using national datasets each. They identify consistently across countries a positive relation between SMP and education. Even thirteen countries are covered by Christelis et al. (2013). A main source is the SHARE-database compiling information about individuals aged fifty and above, thus limiting representativeness in this respect. The authors find that U.S. households have a higher degree of SMP than European households, while the latter more often invest in their home, controlling for characteristics. The analysis suggests that these differences are more due to institutional factors than to individual characteristics. Kaustia et al. (2023) also rely on four waves of SHARE data for 19 European countries. Pooling the data, they find that indeed institutional differences across countries (country fixed effects) contribute about 30% to the explanation. Another 50% is contributed by six individual characteristics that are labelled as "traditional," that is, wealth, income, education, age, gender, and risk aversion. Among the remaining so-called "new" variables, sociability seems particularly important, but also cognitive skills, trust, religiosity, political orientation, and health.

The HFCS is the "Household Finance and Consumption Survey," coordinated by the European Central Bank which collects data in comparable form in many European countries. The first wave

of HFCS data from 2010 is analyzed by Arrondel et al. (2016). Compared to the SHARE data, the HFCS covers all age groups in a country but, unfortunately, it covers less variables of interest than SHARE. The authors find that SMP (precisely: holding risky assets) is positively related to wealth, income, and education. We follow their approach using the HFCS data from 2017, covering 22 European countries in a unified approach, which is also the basis for Figure 1 in the introduction (however, Poland participated in 2017 but not in 2021, and the Czech Republic reversely). Pooling the data of about 90,000 individuals in total, applying country fixed effects, and considering only those potential SMP-determinants that are available in all sample countries leads to a list of eleven variables which are all statistically significant with expected signs and which we mention below (see Appendix B for details).

In another exercise, we analyze those 18 countries with sufficient observations one by one and consider the same determinants as before. Interestingly, there is no single variable which would be significant in all 18 countries, even risk aversion is insignificant in one country (see Appendix B). Still, we get a list of six SMP-determinants that are significant in the pooled sample as well as in the clear majority of countries: wealth (assets), income, education, financial literacy (indicated by two variables: holding voluntary pension and working in the financial industry), age, and risk aversion. Inheritance may be added to this list which is available in 17 countries. Additionally, cultural background, gender, optimism (life satisfaction), and background risk (self-employed) seem important, as they are significant in the pooled sample, while information on peer effects, trust or health is missing in the HFCS-data.

Overall, the studies shortly presented here tend to confirm the groups of SMP-determinants that have been discussed so far. However, not all variables are everywhere available, and not all available variables are in all countries and specifications significant.

4 | IDENTIFICATION OF SMP-DETERMINANTS VIA SHOCKS

In this section we discuss the identification of SMP-determinants via shocks that occur and can be largely regarded as exogenous. Thus, we do not introduce new determinants but new data and approaches as they have dominated the literature over the last 15 years. We present these studies, again—due to the large number of studies—only selectively, in the same order as before (see Figure 2).

4.1 | Wealth shocks

Andersen and Nielsen (2011) use a natural experiment to investigate the impact of changes in wealth on SMP. They analyze the receipt of windfall gains in the form of unexpected inheritance due to sudden death in Denmark. The underlying data are obtained from different administrative registers in Denmark. The central hypothesis of the study is that if fixed participation costs serve as a significant barrier to stock market investment, receiving an unexpected increase in wealth should alleviate financial constraints and lead to increased SMP. To address potential endogeneity issues and selection biases, the paper employs a difference-in-differences strategy, which allows for a comparison of SMP before and after the inheritance between those who receive the unexpected windfall and those who do not. The authors find that receiving a windfall of EUR 134,000 raises an individual's probability of entering the stock market within the following 3 years by approximately 21 percentage points. While this finding underlines that fixed participation costs

indeed pose a hurdle to investing in public equity, it also shows that other constraints seem to play a more important role in staying out of the market. This is further supported by the finding that most households that inherit stocks actively sell their entire position and leave the market.

A related study is Briggs et al. (2021), who exploit the randomized assignment of lottery prizes from a national Swedish lottery to estimate the causal effect of wealth on SMP. The quasi-experimental estimates predict that a lottery windfall of approx. USD 150,000 increases the probability of participating in the stock market by 12 percentage points for households that did not participate in stock markets before. The authors further argue that when applying a standard structural life cycle model, the model predicts much larger rates of participation unless entry costs were implausibly high. They conduct additional analyses and find that a large fraction of the discrepancy in participation rates in model and experimental estimates can be explained by nonstandard beliefs—households hold overly pessimistic beliefs about the future equity premium.

Cheng et al. (2022) also analyze the effect of windfall gains on SMP. They use shopping receipt lotteries in Taiwan and find that each million TWD (approx. USD 35,000) windfall gain increases the probability of participation by 0.76%, translating into 4.34% of the average level. Moreover, they find that the effect is more pronounced among winners that are younger, without kids, and with lower wealth.

Overall, these studies clearly support the important role of wealth as a SMP-determinant but also indicate that other determinants appear important to get a more complete picture of SMP-determinants. An overview of the studies discussed in Section 4 is provided by Table 3.

4.2 | Shocks to transaction costs

Following theoretical explanations of nonparticipation, a reduction in participation costs should lead to an increase in stock market participation. As mentioned in Section 3 already, Bogan (2008) analyzes this channel by examining the impact of the spread of the internet in the 1990s, hypothesizing that households that gained access to the internet over time faced lower participation costs than households that did not have access and should therefore participate to a greater extent. The author uses panel data from the HRS from 1992 to 2002 to estimate the impact of internet access. She finds that access to the internet increases the probability of holding stock equivalent to having over USD 27,000 in additional mean household income. However, while Bogan's (2008) results are convincing at first sight, internet usage drastically increased in the past 20 years while SMP did not accordingly. Following the results of Glaser and Klos (2013) this can be explained by financial literacy: indeed, there is a link between internet usage and SMP, but it is mainly driven by investors with a high degree of financial literacy who are able to efficiently process the cheaper information. The two authors work with the 2001 German SAVE study and use an instrumental variable for internet usage to establish causality. They argue that in the first years of the internet individuals with above-average financial literacy joined the internet and benefitted from reduced information costs causing a strong positive effect of internet usage on SMP as found by Bogan (2008). Individuals joining the internet later exhibited below-average financial knowledge and were not able to benefit from reduced information costs. Supporting the core insight of both prior studies, Hvide et al. (2022) investigate effect of broadband expansion between 2000 and 2010 in Norway which is exogenous to SMP. They find that the effects of broadband internet are larger for the least wealthy and less-educated individuals.

TABLE 3 Overview about exogenous shocks and SMP.

Determinant	Shock	Studies	Country	Empirical method	Findings
Wealth	Inheritance	Andersen and Nielsen (2011)	Denmark	Diff-in-diff	Inheritance windfall of EUR 134,000 increases individual's SMP probability by 21 pp
	Lottery windfalls	Briggs et al. (2021)	Sweden	Panel fixed effects regression	Lottery windfall of USD 150,000 increases probability of SMP by 12 pp
		Cheng et al. (2022)	Taiwan	Panel fixed effects regression	Lottery windfall of approx. USD 35,000 increases SMP probability by 0.8%
Transaction costs	Internet	Bogan (2008)	USA	Univariate probit models	Computer usage increases the probability of holding equivalent to having over USD 27,000 in additional mean household income
		Hvide et al. (2022)	Norway	IV	For every 10 pp increase in broadband internet use the SMP rate increases by 0.7 pp
	Road infra-structure	Agarwal et al. (2021)	India	Panel fixed effects regression	Construction of new feeder roads increases SMP by 3.8%
Education	Compulsory schooling	Cole and Shastry (2014)	USA	IV	Each additional year of schooling increases SMP probability by 4%
		Black et al. (2018)	Sweden	Diff-in-diff	Each additional year of schooling increases SMP of men by 2%
	Economics education	Christiansen et al. (2008)	Denmark	Diff-in-diff, IV	SMP rate of investors who complete an economics education increases significantly by 6 pp when completing education.
Cultural background	Migration	Osili and Paulson (2008)	USA	Linear probability model	Immigrants from countries with more effective institutions are more likely to participate in stock market
	German reunification	Laudenbach et al. (2024)	Germany	Logit regression	East German investors are 15.6 pp less likely to participate in the stock market than West German investors
	Corporate fraud	Giannetti and Wang (2016)	USA	IV	A one-standard-deviation increase in a household's lifetime exposure to local fraud decreases household's probability of SMP by 4%

(Continues)

TABLE 3 (Continued)

Determinant	Shock	Studies	Country	Empirical method	Findings
Expectations	Political corruption	Bu et al. (2022)	China	Diff-in-diff	Removal of top officials due to corruption increases SMP probability by 3 pp
	Great Depression	Malmendier and Nagel (2011)	USA	Probit model	Moving from 10th to 90th percentile of lifetime experienced stock market returns increases SMP probability by 10.2 pp
	Natural disaster	Bharath and Cho (2023)	USA	Linear probability model	One-standard-deviation increase in disaster experiences from below the mean to the mean decreases a household's SMP-rate by 3.5 pp
Macro uncertainty	Elections	Agarwal et al. (2022)	USA	Diff-in-diff	SMP decreases by 2.7% in states with an upcoming gubernatorial election
	Regulation	Gao et al. (2022)	USA	Triple-diff	Households employed in high-emission industries reduce investments in risky assets by 15.4% after the change regulations
	Economic policy uncertainty	Gábor-Tóth and Georgarakos (2018)	USA	Two-way fixed effects regression	One standard deviation increase in EPU implies a 6% net decrease on unconditional probability of SMP
	Financial crisis	Park and Suh (2019)	Korea	Probit model, Tobit model	Doubling of EPU leads to 5.8% reduction in households' SMP probability
Economic shock	Financial crisis	Zhou (2020)	USA	Bivariate probit regressions	Stock ownership in 2009 dropped by 3.5% compared to 2007
		Chen and Stafford (2016)	USA	OLS, logistic and multinomial regression	29.2% of stockowners as of 2007 had become nonowners as of 2009
		Vu et al. (2021)	Europe	Probit regression	Households are less inclined to hold risky assets after the financial crisis
Background risk	Divorce	Christiansen et al. (2015)	Denmark	Diff-in-diff	Marriage causes men to reduce equity investments, whereas divorce increases it. Opposite effects apply to women
	Job loss	Basten et al. (2016)	Norway	Cross-sectional regression	In 4 years leading to unemployment, households reduce holdings of risky assets by about USD 500

In related work, Agarwal et al. (2021) examine the impact of a national road construction program in India that connects previously isolated regions (identified via pincodes) and its effect on SMP. They use data on stock trading activity on the National Stock Exchange of India by over 13 million individuals between 2004 and 2015 and examine the change in SMP around a shock to the rural road network over this period. The authors provide evidence that after the construction of a new road, there is a 3.8% increase in the number of investors in the pincode area, which is mostly driven by male and mature investors. Also, the effect is larger in rural than in urban pincode areas and in pincode areas with intermediate levels of economic development. Lastly, they show that the increase in SMP arises from a reduction in participation costs through reduced information costs (improved connectivity from remote areas leads to higher participation) and through reduced pecuniary costs once new bank branches open in that pincode area.

4.3 | Shocks to education

Black et al. (2018) make use of an exogenous variation in education due to compulsory schooling change combined with wealth data for the Swedish population. The education reform took place in the 1950s and 1960s and increased compulsory schooling from 7 to 9 years in different municipalities at different times. The authors employ administrative data encompassing information on the wealth portfolios of the Swedish population in 2000 to investigate the causal impact of an increase in education by an induced legislative change on the portfolios of individuals born around the time of the law change. To identify this effect, they employ a difference-in-difference approach, which allows isolating the specific influence of the increase in education. The study finds a causal effect of education on men's decision to participate in the stock market. Specifically, each additional year of schooling increases SMP by 2% from a baseline participation rate of 42%. However, no evidence of an effect on women is observed, which the authors attribute to the fact that women already had higher average education levels before the reform, thereby reducing the impact of the reform for them. Additionally, the authors explore potential channels through which education influences SMP and identify greater financial wealth as the main one.

In a similar vein, Cole and Shastry (2014) use changes in state compulsory education laws between 1914 and 1978 in the U.S. as an instrument for educational attainment. They find that an additional year of education increases the probability of owning stocks by 4%. In some contrast to Black et al. (2018), the authors suggest that the effect is driven by changes in savings or investment behavior, rather than simply by increased labor earnings.

Finally, Christiansen et al. (2008), a paper mentioned above already, make use of two exogenous variations regarding economics education to identify an effect: first, they analyze the change in SMP when somebody with an economics education newly joins a household; second, they build an instrument based on the opening of a new university nearby which increases the probability of an economic education. Both estimations result in an increase in SMP.

4.4 | Shocks in cultural background

Osili and Paulson (2008) investigate the impact of institutional quality in the country of origin on SMP for different immigrant groups in the United States given the relatively low participation of immigrants compared to similar individuals born in the United States. They use migration

to the U.S. as a sudden change in the institutional environment where all immigrants are now facing the same environment, but their beliefs and trust in (financial) institutions were shaped by the country of origin. The results emphasize the importance of institutions: immigrants from countries with more effective institutions are significantly more likely to participate in the stock market than immigrants from countries with less effective institutions and these results hold for both recent immigrants and immigrants who have lived in the U.S. for up to 27 years. To address the concern of self-selection bias among immigrants and their choice of country of residence, the authors develop a measure of institutional quality that varies by country. They also observe that the impact of institutions in the country of origin persists even for immigrants who were younger than 16 at the time of migration. For this group, migration could be considered as an exogenous shock.

In a related study, Laudenbach et al. (2024) delve into the enduring impacts of residing in a communist regime and its anti-capitalist ideology on households' SMP. The authors utilize an extensive dataset from German brokerages and leverage the German reunification as a natural experiment. Notably, before the reunification, East Germans had minimal exposure to the stock market and were exposed to strongly negative perceptions of it. However, following the reunification, they found themselves operating within the same investment landscape and under the same institutional framework as their West German counterparts. Using a logit regression, the authors find that East German investors are 15.6 percentage points less likely than West German investors to participate in the stock market, a finding which remains robust even when accounting for several other variables such as risk aversion, income, or financial literacy. This finding also holds for East Germans who self-selected into the West German system and moved to West Germany after reunification.

4.5 | Shocks to trust

Giannetti and Wang (2016) analyze the impact of revelation of corporate fraud on SMP in the U.S. and find that households decrease holdings in fraudulent as well as nonfraudulent firms. They use longitudinal data from the Panel Study of Income Dynamics (PSID), the Federal Securities Regulation, a large discount brokerage firm, and the Gallup Analytics surveys on "Confidence in Institutions" to test the impact of fraud revelation on SMP across states and over time. The authors create an instrument for fraud by using the sudden demise of the auditing firm Arthur Andersen following the Enron debacle as an exogenous shock. The demise of Arthur Andersen led to the abrupt change of auditors for their clients, subsequently increasing the likelihood of fraud detection in these companies. Leveraging this event, the authors use the fraction of public firms in a state that had to change auditors as an instrument for fraud revelation and estimate a negative effect of the instrument on SMP. They further find evidence that the documented effect is likely to reflect a loss of trust in the stock market.

Bu et al. (2022) study how political corruption affects SMP among households in China using the anticorruption campaign launched in 2012 in China as an exogenous shock. They exploit the staggered removal of top provincial officials on corruption charges using a difference-in-difference estimation and find that the removal of top officials during the campaign increases the probability of SMP by three percentage points, which is a statistically and economically significant estimate given the average participation rate of 7.9% in China. The authors show that the effect is predominantly driven by a reduction in households' trust and perceptions of institutional quality rather than by households' accumulation of wealth.

4.6 | Individual expectation shocks

Malmendier and Nagel (2011), already shortly mentioned above, investigate whether individual experiences of macroeconomic shocks affect individual financial risk taking and return expectations. More precisely, the authors examine whether those who have weathered periods of low real stock market returns in their lifetimes, such as during the Great Depression, exhibit a heightened aversion to financial risks and are less likely to participate in the stock market (Knüpfert et al. (2017) find similar results for a different setting). To do so, the authors use cross-sectional SMP data from the U.S.-SCF between 1960 and 2007 and relate, amongst others, households' SMP to households' experienced histories of stock returns. The data reveal that individuals' past exposure to stock-market realizations has significant explanatory power for the decision to invest in the stock market: households with higher experienced stock market returns express a higher willingness to take financial risk, participate more in the stock market, and, conditional on participation, allocate a greater proportion of their liquid assets to stocks. More precisely, moving from the 10th to the 90th percentile in terms of lifetime experienced stock market returns within the sample corresponds to a 10.2 percentage point increase in the probability of SMP. Further investigating channels through which past experiences affect return expectations, Malmendier and Nagel (2011) use microdata on stock return expectations from the UBS/Gallup survey from 1998 to 2007 and show that a mere 1 percentage point increase in an individual's experienced stock return is linked to a consequential 0.5–0.6 percentage point rise in the anticipated stock market return for the subsequent year.

In a similar vein, Bharath and Cho (2023) use data from the National Longitudinal Survey of Youth 1979 to examine whether natural disaster experiences affect households' portfolio choice decisions. By exploiting within-household variation in a household's lifetime disaster experiences, the authors find that a one-standard-deviation increase in disaster experiences from below the mean to the mean decreases a household's SMP-rate by 3.5 percentage points, a 7.9% decrease relative to the sample mean participation rate which is equivalent to a 23% decrease in liquid assets. Investigating potential channels, Bharath and Cho (2023) find that income and wealth shocks related to the natural disaster can explain only about 25% of the observed changes in SMP and conclude that disaster experiences alter households' risk aversion and return expectations.

4.7 | Macro uncertainty shock

Another line of research explores the potential linkage between political shocks and SMP. Agarwal et al. (2022) utilize the longitudinal Survey of Income and Program Participation (SIPP) spanning the period from 1996 to 2011 and exploit U.S. gubernatorial elections as a quasi-natural experiment for political uncertainty. They conduct a difference-in-difference regression to isolate the effect of political uncertainty on households' SMP and find a significant 2.7% decrease in the participation rate in states with an upcoming gubernatorial election. Moreover, this effect is stronger in close elections and when incumbent governors are subject to term limits. Investigating potential channels, the authors provide evidence that greater employment or labor income risk due to political uncertainty play a role in influencing individuals' decisions to participate in the stock market.

Gao et al. (2022) study the staggered adoption of climate change action plans in the U.S. to shed new light on the linkage between climate change regulations and households' risky asset allocations. They do so by conducting a triple-differences framework and find that climate change

action plans lead to a reduction in the share of risky assets by 15% for households in high-emission industries, which is explained by an elevation of labor income risk.

Several other studies make use of the economic policy uncertainty index (EPU) developed by Baker et al. (2016) to investigate the relationship between political uncertainty and SMP. For example, Gábor-Tóth and Georgarakos (2018) analyze the potential relationship using the HRS survey in the U.S. and Park and Suh (2019) use the Korea Labor and Income Panel Study. The first find that households with more exposure to economic policy uncertainty news are less likely to invest in stocks and the latter find that policy uncertainty significantly reduces the amount of risky assets in a household's portfolio.

4.8 | Economic shock

Zhou (2020) examines SMP among U.S. households during the crisis period of 2007–2009 using data from the PSID. The author finds that after controlling for standard household characteristics, stock ownership in 2009 dropped by 3.5% compared to 2007. Furthermore, less-educated households, poor households, and minority households were more likely to drop out of the stock market. Similarly, Chen and Stafford (2016) focus on stock ownership among U.S. families during the same period and explore the relationship between stock market activity, mortgage holdings, and mortgage payments, as reported in Section 3.2 above. Additionally, Vu et al. (2021) analyze households' investments in risky assets before and after the financial crisis using data from the Survey of Health, Ageing and Retirement in Europe (SHARE), encompassing two waves in 12 countries (2006–2007 and 2010–2011). They find that households with higher net wealth, higher education levels, greater likelihood of receiving inheritance, better self-perceived health, and more social activities tend to own risky assets both before and after the financial crisis.

4.9 | Shocks in background risk

Christiansen et al. (2015) delve into the impact of changes in marital status on SMP. By utilizing panel data from 1997 to 2003 provided by Statistics Denmark, the authors examine the investment behavior of the same investors over time to uncover the effects of marriage and divorce. To assess the causal relationship between marital status changes and SMP, the authors employ a difference-in-difference estimation strategy. They compare the investment behavior of individuals experiencing a marriage or a divorce with those who remain single or married, respectively. This approach allows them to isolate the specific effects of these marital transitions on SMP. The study finds that marriages cause men to reduce the fraction of wealth held in stocks, whereas divorce increases it. The authors observe the opposite effect for women. Further, they explore potential channels driving these observed effects. The authors show that labor income risk sharing plays a significant role in explaining the relationship between marital status changes and SMP. Specifically, investors with highly correlated income processes—indicating a higher level of income risk sharing with their spouse—tend to exhibit smaller changes in their stock market participation following marital transitions.

Basten et al. (2016) further investigate the relation between employment shocks and SMP by analyzing the development of household asset holdings over a 9-year period around job loss, using administrative panel data from Norway. They observe panel data from 1995 to 2007 and construct a main sample of households where the man (as main breadwinner) experiences his first unemployment spell between 1999 and 2003 and complement this sample with otherwise comparable households that do not experience unemployment. They find that households, on average, are

able to anticipate potential job loss in advance and shift wealth from risky to safe assets. More precisely, in the 4 years leading up to unemployment, the average household accumulates an additional USD 1500 in safe assets and reduces its holdings of risky assets by about USD 500. Accordingly, individuals working in industries with high unemployment risk may shy away from stocks.

5 | CONCLUSION

The literature aiming to explain the SMP-puzzle has become huge since the 1990s. In line with this growth, the number of proposed variables to be potential SMP-determinants has also increased tremendously. Thus, there is a need to take stock, that is, to structure the set of potential determinants and trying to distinguish established determinants that can be regarded as stylized facts from others that are likely but require robustness checks.

This ambition is hindered by the heterogeneity of studies. Basically, every study uses a different set of control variables, and most of them rely on samples of single countries with the respective specific institutional environment. Thus, we proceed in four steps: first, we decide to structure the determinants into four broad groups as derived from capital market theory. Second, we consider a large number of high-quality studies, allocate them into our structure, and describe the main arguments. A limitation of the earlier literature of SMP-determinants is that causality is often not explicitly proven. In a third step we therefore focus on more recent studies which all exploit the evidence from exogenous shocks to proof a causal impact of determinants. Fourth, we bring the evidence from the various empirical approaches together, suggesting a set of established determinants and a group of likely determinants which would profit from further examination. These variables and the respective empirical results are shown in Table 4.

The list of 11 established determinants is identical to variables being tested in studies with exogenous shocks plus risk aversion (which seems difficult to test in such a framework). This set is not surprising, as it contains (i) wealth and its related variables, (ii) inheritance and (iii) transaction costs. Moreover, (iv) educational level, (v) cultural background, (vi) trust, and (vii) expectations seem well established. Evidence is also strong regarding determinants (viii) macro uncertainty and (ix) economic shock, and (x) extreme risk aversion and (xi) job loss (indicating background risk). We think that these variables can quite safely be regarded as established determinants of SMP.

There are another 13 variables which we classify as likely determinants of SMP. Here, more research seems desirable, in particular when it comes to clear identification of effects. Research on these variables may be challenging because of specific reasons each: regarding income there is evidence that it matters in addition to wealth, even though both variables are highly correlated, but income changes (while controlling for wealth changes) should be of interest. Regarding the knowledge variables, they are often introduced one after the other, and rarely in a shock setting. While the latter is not easy to imagine, as changes may be endogenous, it seems important to control for related variables in order to see which ones drive out others. This procedure, however, is limited by available data.

The importance of age is less obvious, and most of its bilateral relation to SMP is explained by other variables. Peer effects seem to be important but are typically examined in a cross-sectional analysis. The case is similar regarding most variables on background risk. Moreover, homeownership may be often a substitute to SMP in the European setting, not in the U.S. Also, bad health may distract people from SMP, but there is hardly broader and rigorous evidence. Finally, the role

TABLE 4 Overview of established and likely determinants for SMP.

Category	Characteristic	Proven		Conclusion	
		Single studies	Shocks	Established	Likely
Direct costs	Wealth	✓	✓	✓	
	Inheritance	-	✓	✓	
	Income	✓	-		✓
	Transaction costs	✓	✓	✓	
Knowledge	Education	✓	✓	✓	
	Cognitive abilities	✓	-		✓
	Financial literacy	✓	-		✓
	Financial industry	(✓)	-		(✓)
	Business-related job	(✓)	-		(✓)
Further information	Cultural background	✓	✓	✓	
	Age	(✓)	-		(✓)
Trust	=	(✓)	✓	✓	
Peer effects	=	✓	-		✓
Expectations	Individual expectations	(✓)	✓	✓	
Macro uncertainty	=	(✓)	✓	✓	
Economic shock	=	✓	✓	✓	
(Extreme) risk aversion	=	✓	-	✓	
Background risk	Job loss	(✓)	✓	✓	
	Self-employed	(✓)	-		(✓)
	Homeownership	(✓)	-		(✓)
	Health	(✓)	-		(✓)
	Marital risks	(✓)	(✓)		(✓)
Gender	=	(✓)	-		(✓)
Loss aversion	=	✓	-		✓
Ambiguity aversion	=	✓	-		✓

Note: This assessment is to some degree necessarily subjective. ✓ means that evidence is clear; (✓) means that evidence is not fully clear, mostly due to a lack of studies.

of non-standard preferences seems to be well documented, although there are not many studies having proper data available.

Overall, future research could go into three directions, as indicated indirectly above: first, aiming for a more rigorous identification of the impact of specific SMP determinants, such as those classified as likely determinants in Table 4. Second, controlling for a wider set of potentially competing or generally relevant variables when deriving the impact of a specific new determinant. Third, improving the robustness of results by using broader cross-country studies than those discussed in Section 3.3; they should ideally exploit fully comparable and also representative data. Thus, despite some maturity of the SMP literature there is still much room to deepen our understanding of determinants.

For policymakers most determinants are beyond direct control of policy, but there may be two directions to tackle the SMP-puzzle. First, strong evidence shows that a better knowledge and understanding of financial markets in general and stocks in particular contributes to increased

SMP. Second, knowing about people's hinderances of SMP, there may be ways to set-up financial products which help to overcome such limited rationally barriers against SMP (e.g., Calvet et al., 2023).

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CONFLICT OF INTEREST STATEMENT

None.

DATA AVAILABILITY STATEMENT

Data used in this study are from the HFCS (Household Finance and Consumption Survey) organized by the European Central Bank. They make anonymized microdata available to researchers on request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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