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Behavioral biases and over-indebtedness in consumer credit: evidence from Malaysia

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ABSTRACT

Over-indebtedness in relation to consumer loans represents an important issue for consumers as it impacts their financial well-being. Identifying the risk factors associated with over-indebtedness is crucial in overcoming this problem. Existing literature shows that behavioral biases influence individuals' financial decision making. This study analyses the relationship between behavioral biases and over-indebtedness among consumer loan holders in Malaysia. It aims to investigate whether self-control bias, overconfidence, mental accounting, and availability bias are linked to over-indebtedness. The analysis is done based on a sample of 433 credit card or personal loan holders. The results indicate that self-control bias is linked to higher overall over-indebtedness. Meanwhile, overconfidence and mental accounting are linked to lower overall over-indebtedness. Availability bias is shown to worsen credit card debt repayment decisions. These findings highlight the need for financial education programs that address self-control issues and raise awareness of behavioral biases, helping consumers make more informed financial decisions. Additionally, policymakers in Malaysia can leverage these insights to design targeted strategies that reduce over-indebtedness in managing consumer loans.

IMPACT STATEMENT

This study explores how behavioral biases like self-control, overconfidence, mental accounting and availability bias contribute to over-indebtedness among consumer loan holders in Malaysia. The findings suggest that targeted financial education can help consumers make better financial decisions, reduce debt, and improve overall financial well-being. Addressing these issues supports SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 10 (Reduced Inequalities) by promoting financial literacy, responsible borrowing, and economic stability.

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1. Introduction

Many countries have witnessed rising consumer debt. According to the Life-Cycle-Permanent Income theory, households maximize utility from lifetime consumption by evening out their income stream over their lifetime through borrowing or savings (Ando & Modigliani, 1963). As such, indebtedness is often seen as a planned decision to transfer future resources to the present to increase current consumption. This can be viewed positively from an economic perspective, as the increased consumption of goods and services can stimulate production and drive economic growth. Nevertheless, greater reliance on consumer debt and poor debt repayment raises concern as it can result in lower credit scores, asset repossession, bankruptcies, and credit market exclusion (Gathergood, 2012; Kim et al., 2020).

Even though rising indebtedness has been more prevalent in developed countries, in recent times, developing countries like Malaysia has also experienced similar trends. In 2020, Malaysia's household debt reached approximately 93.2% of GDP, highlighting significant levels of consumer indebtedness, largely driven by increased borrowing for housing, personal loans, and credit cards. The increase in

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consumer credit is mainly driven by lenient eligibility requirements and simplified approval processes for credit cards and personal loans. According to data released by the Credit Counselling and Debt Management Agency (AKPK), credit card debt and personal loans now make up 55 and 33% of the total debt portfolio managed by the agency, respectively (Hani, 2019). Notably, bankruptcies associated with these forms of debt more than doubled between 2012 and 2018 (World Bank, 2019).

In particular, the younger generations are increasingly burdened with debt due to the rise of consumer credit and the "financialisation of everyday life" (Coffey et al., 2024). Demographically, about 35% of Malaysia's population falls within the 21–40 age range (Department of Statistics Malaysia, 2023). This younger age group, particularly those with lower incomes, has increasingly relied on consumer credit to sustain more affluent lifestyle choices (World Bank, 2019). Data from Bank Negara Malaysia (2022) indicates that debt is a significant issue for younger and lower-income Malaysians. In 2022, the median debt-to-income ratio was lower for individuals earning between RM3000 and RM5000 compared to those earning above RM5000. However, the majority of participants in the Debt Management Programme offered by the AKPK came from the lower-income group, with 78.39% earning less than RM5000. Among those enrolled, 55.62% were aged between 20 and 40 years, indicating a rising debt burden among younger Malaysians. Data released in 2022 shows that 52.61% of bankrupt borrowers are millennials aged 25–44 (Malaysian Department of Insolvency, 2022). Additionally, the Malaysian Consumer and Borrower Settlement Association reports that personal loans account for nearly half (49.14%) of the 35,714 bankruptcy cases among youth between 2019 and 2023 (Malay Mail, 2023). This suggests that younger individuals and low-income earners in Malaysia are disproportionately impacted by consumer credit-related debt, highlighting the need for a deeper understanding of the factors driving debt accumulation among this group. Policymakers are increasingly concerned about the rising over-indebtedness, not only due to its detrimental impact on consumers' well-being but also due to its potential threat to the country's financial stability.

Debt repayment is an integral part of an individual's financial decision-making. Over-indebtedness happens when an individual cannot service debt using his or her current earnings and any extra resources obtained from the disposal of real or financial assets (Anderloni et al., 2012). Increasing incidences of over-indebtedness and its negative consequences have led to considerable interest in identifying the causes of over-indebtedness. Existing research on the determinants of over-indebtedness has focused on aspects related to individual characteristics, credit markets, and macroeconomic factors (Leandro & Botelho, 2022). Studies looking at individual characteristics have dwelled on topics related to behavioral biases. Existing empirical evidence show consumers are more prone to behavioral biases when making borrowing decisions related to unsecured loans such as credit card and personal loans (Bartholomae & Fox, 2021; Livshits, 2020) as individuals engage in less time and thought processes while making decisions related to such loans (Lea, 2021).

Behavioral bias results from emotional and cognitive shortcuts that simplify decision-making but often lead to systematic errors or deviations from rational judgment. Self-control bias and overconfidence are biases related to an individual's emotional state (Baddeley, 2013). In contrast, mental accounting and availability bias are biases that are related to the cognitive shortcuts used by an individual (Tversky & Kahneman, 1974). Lack of self-control is identified as one of the leading causes of over-indebtedness that arises due to time-inconsistent preference that individuals have for the present compared to the future (Kilborn, 2005; Livshits, 2020; Lusardi et al., 2019; Shen, 2014). Overconfidence bias can lead to over-indebtedness by causing individuals to overestimate their ability to repay loans or manage financial risks, leading them to take on more debt than they can afford (Cwynar et al., 2020; Kilborn, 2005). Mental accounting can cause individuals to treat different sources of money or types of debt separately, ignoring the overall financial picture. This have been linked to debt accumulation (Besharat et al., 2015; Sharma et al., 2019). Availability bias can lead to debt accumulation by causing individuals to overvalue the immediate accessibility of credit and underestimate the risks or challenges of repayment, ultimately resulting in excessive borrowing (Lea, 2021).

While a significant body of research on behavioral biases and over-indebtedness exists in developed countries like the United States, United Kingdom, and Europe, there is a notable gap in studies examining this issue within the context of developing countries (Leandro & Botelho, 2022). Existing studies on the determinants of household debt in Malaysia have mainly focused on macroeconomic factors (Azmin

et al., 2019; Yahaya & Sarwe, 2019); psychological factors (Azma et al., 2019; Zakaria et al., 2017); financial literacy (Idris et al., 2016) and demographics and socio-economic factors (Hussin et al., 2013). This study aims to fill the gap in the literature by investigating how behavioral biases such as self-control bias, overconfidence, mental accounting, and availability bias contribute to over-indebtedness among young and low-income consumers in Malaysia who increasingly depends on credit to maintain lifestyle needs. The primary objectives are to identify which behavioral biases most significantly impact over-indebtedness while accounting for demographic factors. The central research questions are: To what extent do self-control bias, overconfidence, mental accounting, and availability bias contribute to over-indebtedness among young, low-income Malaysians?

To address this question, the study focuses on Malaysian consumers holding credit card or personal loans, specifically targeting young individuals aged 21 to 40 who earn between RM2000 and RM5000 per month. This demographic is crucial, as they represent a significant portion of the workforce and often rely on credit to meet their financial needs. To analyze the data, logistic regression is used, as it effectively models binary outcomes, such as the likelihood of being over-indebted. This approach allows for a comprehensive examination of how various behavioral biases impact over-indebtedness, offering valuable insights into the main drivers of consumer debt behavior. The findings indicate that behavioral biases significantly affect the likelihood of over-indebtedness. Specifically, self-control bias is associated with a higher risk of overall over-indebtedness, as well as increased vulnerability to credit card and personal loan debt. Conversely, overconfidence and mental accounting appear to reduce the likelihood of becoming over-indebted. However, availability bias worsens credit card debt repayment decisions. The discussion section provides insights into potential strategies for improving debt repayment behaviors in Malaysia.

The remainder of the article is organised as follows. Section 2 reviews the current literature and develops hypotheses. Section 3 describes research methodology and data collection. Section 4 includes the findings and discussions. Section 5 presents the conclusion and implications.

2. Literature review and hypotheses development

Existing studies have attributed over-indebtedness to self-control bias, overconfidence, mental accounting, and availability bias.

2.1. Self-control bias

The behavioral life cycle theory incorporates self-control in understanding savings behavior to account for the trade-off between instant gratification and long-term gains in saving decisions (Shefrin & Thaler, 1988). They postulate that an individual's financial behavior over their lifetime is influenced by their ability to control impulses and the associated costs. By including self-control in their model, they capture the internal struggle between rational and emotional aspects of decision-making. Similarly, the theoretical model of a competitive credit market by Heidhues and Koszegi (2008) demonstrates that when individuals have a time-inconsistent preference for immediate gratification, they will overborrow. This results in welfare losses due to delays in repayment and penalty payments.

Meier and Sprenger (2010) study based on individuals from diverse community backgrounds in Boston confirm that self-control bias, driven by immediate gratification tendencies, leads to higher credit card debt. Their unique approach combines incentivized choice experiments with objective borrowing data, providing strong evidence of the link between present bias and debt accumulation. Ottaviani and Vandone (2011) studied a specific group of full-time employees at asset management companies, finding that impulsive individuals are more likely to accumulate unsecured debt, such as credit cards and personal loans, while showing no significant increase in secured debt like mortgages. This distinction arises because unsecured loans like credit cards and personal loans are often used for impulsive purchases. Gathergood (2012), in a UK-based study, finds that individuals with self-control problems are more likely to utilize easily accessible credit in making impulse-driven purchases that lead to over-indebtedness. While Barboza (2018) and Kuchler and Pagel (2021) focus on self-control as driver of delayed credit card repayments, Grohmann and Hamdan (2021) examine how self-control, combined

with financial literacy, affects impulsive borrowing. Their findings indicate that lower levels of self-control are associated with higher impulsive borrowing, but this effect can be mitigated by higher financial literacy. Meanwhile, using self-reported debt data from Japanese consumers, Ikeda and Kang (2015) find that hyperbolic discounting leads individuals to hold debt despite a general aversion to borrowing, as they prioritize immediate benefits over future costs. While similar to self-control bias in driving short-term decisions, hyperbolic discounting uniquely causes individuals to heavily undervalue future outcomes, leading them to favor immediate spending despite knowing the future financial consequences.

While these findings are valuable, their focus on developed countries with stronger consumer protections may limit their applicability to the debt management challenges faced by low-income borrowers in less regulated credit markets within developing economies. In collectivist societies like Malaysia, individuals often prioritize family and community needs over personal financial stability, which can lead to greater reliance on loans or credit cards to fulfil these obligations, thereby increasing debt obligations (Hofstede, 2011). This can amplify self-control bias, making it a crucial factor to examine. Additionally, the widespread availability of credit in Malaysia further intensifies self-control bias, particularly among young, low-income consumers, leading to substantial debt accumulation. This easy access to credit increases impulsive spending, making debt management more challenging for this demographic. In contrast, Mahdzan et al. (2023) finds that Malaysians with strong religious beliefs tend to avoid credit card or personal loan borrowing, as their values encourage discipline and self-control in financial decisions. These contexts highlight the importance of studying self-control bias to understand its unique effects on debt behavior in Malaysia. Based on these observations, we posit the following hypothesis:

H_1 Self-control bias is significantly associated with over-indebtedness.

2.2. Overconfidence

The Dunning-Kruger Effect helps explain overconfidence bias, as it illustrates how individuals with limited knowledge or expertise may overestimate their abilities, leading to an inflated confidence in their decisions and judgments (Kruger & Dunning, 1999). Similarly, Benoît and Dubra (2011) describes overconfidence through a model involving rational Bayesian updaters, suggesting that overconfident individuals often avoid seeking additional information to prevent adjusting their beliefs downward. As a result, overconfident individuals are more likely to spend less time and effort making the decision (Willis, 2008). Additionally, overconfident individuals are likely to believe that they have more knowledge than they do and, as a result, may put more weight on their judgments than other inputs (Anderloni et al., 2012). In financial decision-making, individuals may overestimate their ability to assess the risk and resulting outcome of their choices.

Overconfident individuals tend to emphasize subjective judgment over objective accuracy (Im & Oh, 2016). Robb et al. (2015) used survey methodology to investigate how overconfidence bias affects consumers' use of alternative financial services (AFS). The findings reveal that individuals exhibiting higher levels of overconfidence are more inclined to utilize AFS, as they tend to underestimate the risks involved and overestimate their own financial decision-making skills. Using an online survey, Merkle (2017) finds that investors often overestimate their abilities, which leads to higher trading, greater risk-taking, and lower portfolio diversification. The research shows that while past successes may boost overconfidence, negative experiences can eventually help investors develop a more realistic view of their financial abilities. Allgood and Walstad (2016) observes that overconfidence in financial literacy negatively impacts credit card management, leading individuals to engage in riskier financial behaviors despite lacking the actual knowledge to support such decisions. In contrast, Kim et al. (2020) finds that households exhibiting overconfidence are more prone to mortgage delinquency, as they tend to underestimate the complexities and risks associated with mortgage financing.

Carlsson Hauff and Nilsson (2020) find that individuals with higher borrowing tendencies, driven by overconfidence, are more likely to engage in risky financial behaviors. Similarly, Cwynar et al. (2020) reveal that overconfidence leads to less cautious decision-making and increased debt accumulation. In contrast, Hsu (2022) explores how overconfidence affects the seeking of financial advice, showing that

individuals who overestimate their financial expertise are less likely to consult professionals, which may result in suboptimal financial outcomes. Meanwhile, overconfidence in financial markets can cause individuals to take on more risk than they can manage, stemming from an inflated belief in their ability to control outcomes. In stock trading, this often results in excessive trading activity, which can increase market volatility and adversely affect portfolio performance (Akin & Akin, 2024). Meanwhile, Bouteska et al. (2023) analyses on U.S. investors during the COVID-19 period finds that stock returns drive trading volumes, supporting the existence of overconfidence bias. Together, these studies highlight the detrimental impact of overconfidence bias on financial management and decision-making.

However, studies also have revealed positive consequences of overconfidence. Bannier and Schwarz (2018) analysed cross-sectional data on the financial behavior of German households regarding savings and retirement, utilizing an instrumental variable approach. They find a positive relationship between confidence in financial knowledge and financial wealth among men, while this connection is significantly weaker for women. Similarly, Allgood and Walstad (2016) finds that overconfidence in financial literacy can encourage one to invest in stocks and prepare for retirement, while Anderson et al. (2017) finds that overconfident is linked to a greater propensity to save and plan for retirement.

Lack of studies have looked the connection between overconfidence bias and financial decision-making in the context of Malaysia, where unique cultural factors such as "saving face" shape financial behaviours. The concept of "saving face" emphasizes maintaining a positive self-image within social networks (Radermacher et al., 2017), which can lead individuals to overestimate their financial abilities to project success and competence. Additionally, social pressure to take on debt for family support or lifestyle maintenance may lead young and low income individuals to underestimate long-term risks, assuming easy repayment. Furthermore, the easy access to consumer credit with low eligibility requirements can heighten this overconfidence, creating a false sense of financial security. Based on this, we posit the following:

H_2 Overconfidence is significantly associated with over-indebtedness.

2.3. Mental accounting

The cognitive principle of categorization is used to describe mental accounting (Henderson & Peterson, 1992). Under the mental accounting theory, wealth is grouped into different mental accounts that are considered non-fungible (Thaler, 1999). The grouping simplifies the evaluation process in making financial decisions, improving cognitive efficiency as less time and effort are needed to make judgments (Henderson & Peterson, 1992). In addition, mental accounting also acts as a self-control mechanism used by consumers to monitor their expenses and control consumption (Cheema & Soman, 2006; Heath & Soll, 1996). On the one hand, the segregation of wealth done under mental accounting can lead to debt aversion when the pain associated with debt repayment is not coupled with the gain related to consumption (Prelec & Loewenstein, 1998). On the other hand, it can lead to debt-seeking behavior among those with negative net worth and higher debt holdings (Sussman & Shafir, 2012).

Existing studies have also associated mental accounting with the simultaneous holding of high-interest debt and low-interest saving when consumers create separate mental accounts for debt and saving. Ranyard et al. (2006) investigate the role of mental accounting in consumer credit decision-making processes, focusing on how individuals categorize and evaluate their financial resources in relation to credit use and debt management. Employing a qualitative methodology, this study finds that mental accounting significantly influences consumers' perceptions of credit and debt, often leading to suboptimal financial decisions as individuals prioritize certain expenditures or debts based on their mental allocations. Zhang and Sussman (2018) used a mixed-methods approach to investigate how mental accounting influences individuals' budgeting and investment behaviors. The findings indicate that mental accounting helps individuals stick to budgeting and be financially disciplined. Sui et al. (2021) used survey method to collect quantitative data on participants' spending habits and their mental accounting practices. The findings reveal that mental accounting increases consumers' overspending because people misallocate their funds and treat money differently based on its source or purpose.

Changwony et al. (2021) uses survey method in investigating how mental accounting affects households' wealth allocation decisions based on their savings goals. The findings reveal that mental accounting significantly influences resource allocation, as households categorize their savings according to specific goals, which in turn impacts their investment strategies and overall financial behavior. Mahapatra et al. (2022) investigate the influence of mental accounting on personal financial planning among Indian households. Utilizing a mixed-methods approach, the study finds that mental accounting significantly impacts financial planning, as households tend to categorize their finances based on specific purposes, which affects their budgeting decisions and overall financial management strategies.

In summary, while these studies collectively enhance our understanding of mental accounting's influence on financial behavior, their applicability to the Malaysian context may be limited due to cultural differences. (Zakaria et al., 2017) finds that younger Malaysian have a greater tendency to get into debt due to their "wants" rather than "needs". This tendency aligns with mental accounting, as young individuals categorize expenses into "needs" versus "wants," which can lead to ineffective debt management and an increased risk of over-indebtedness. An in-depth analysis of the effect of mental accounting on consumer over-indebtedness in Malaysia would offer valuable insights into these dynamics. Based on this, we posit the following:

H_3 Mental accounting is significantly associated with over-indebtedness.

2.4. Availability bias

Due to limitations in cognitive processing capacity, individuals utilize mental shortcuts to simplify decision-making (Kahneman, 2011). Individuals tend to pay more attention to information that can be easily remembered. The availability heuristic is judged based on the probability or frequency of how easily or fast an event comes to mind (Tversky & Kahneman, 1974). Salient and familiar incidences are more easily retrieved from memory and, as a result, are judged as more common. This suggests that individuals tend to estimate the probability of an event based on how easily it can be recalled rather than on how likely it will happen. In line with this, Eisenman (1993) finds that inaccurate information frequently presented in the media has more bearing on individuals' opinions than the facts. Meanwhile, Kilborn (2005) asserts that individuals have a lower tendency to retrieve negative information that is not presented frequently and saliently. This may cause consumers to overlook serious problems and underestimate the possibility of the problem happening in the future.

Studies have documented availability bias in stock market investment by showing that investors make investment decisions based on familiarity. Barber and Odean (2008) investigate the impact of availability bias on the investment decisions of individual and institutional investors, employing a quantitative methodology that analyses trading data in relation to news coverage and investor attention metrics. They find that stocks recently in the spotlight attract investors' attention when making investment decisions, showing that availability bias leads investors to focus on readily available information, which often results in irrational buying based on sensational news rather than fundamental analysis. Lee et al. (2008) examine the role of availability bias in financial analysts' long-term growth predictions. Utilizing a quantitative approach, the researchers analyze forecast data from various analysts to assess the impact of recent performance and market trends on their optimism. The findings reveal that analysts tend to exhibit excessive optimism in their growth forecasts, often influenced by easily accessible information, which can lead to biased and overly positive predictions about future performance. Kliger and Kudryavtsev (2010) studied the impact of the availability heuristic on investor reactions to significant events concerning specific companies. By analyzing stock price movements and trading volumes in response to various company-specific news, they found that investors often overreact to recent information, with readily recalled details shaping their perceptions and resulting in disproportionate market responses. Similarly, Xie et al. (2023) investigate how the availability heuristic influences investors' expectations of future returns, employing a quantitative approach to analyze survey data across various asset classes. Their findings indicate that investors base their expected returns on recent experiences and easily recalled information, leading to biased expectations that may not accurately reflect underlying

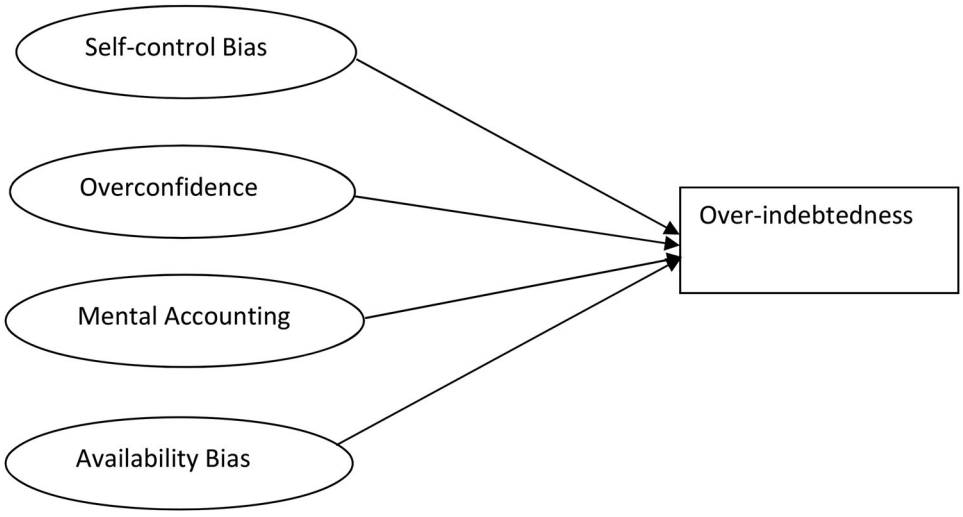

Figure 1. Conceptual framework (Arrows indicate significant associations based on logistic regression analysis. These do not imply causation.).

market fundamentals. Meanwhile, Akin and Akin (2024) assert that availability bias influences investor behavior, leading individuals to overreact to news about interest rate hikes, especially when they can easily recall a recent market crash associated with similar increases. This tendency to rely on readily accessible memories can result in disproportionate market reactions, as investors may make decisions based on emotionally charged past events rather than conducting a balanced assessment of the current economic conditions.

These suggest that individuals' tendencies to overweigh familiar information over all available information significantly impact their financial decisions. However, the applicability of these findings may be limited in contexts such as Malaysia, where regulatory factors influence perceptions of debt and default. With fewer requirements for risk disclosures in credit advertising than in developed countries, credit options in Malaysia may appear more accessible and less risky. Rising bankruptcies among young, low-income individuals in Malaysia due to unpaid consumer loans are becoming increasingly common, potentially normalizing high bankruptcy rates within this group and encouraging further over-indebtedness. This trend may amplify availability bias among young, low-income Malaysians, making them more vulnerable to debt compared to individuals in more tightly regulated environments. Based on this, we derive the following hypothesis:

H_4 Availability bias is significantly associated with over-indebtedness.

Based on the above discussions, Figure 1 illustrates the conceptual framework of the study.

3. Methodology

3.1. Sampling and data collection

The convenience sampling method was used for data collection. A self-administered questionnaire was posted online. Online surveys have the benefit of being cost-effective and less time-consuming (Nayak & Narayan, 2019). The survey link was distributed via various social media platforms, including emails, Facebook, Instagram, WhatsApp, and other options. Using social media for convenience sampling may introduce bias by mainly attracting participants with better internet access and digital literacy, potentially excluding parts of the target demographic. However, we chose this method because it is cost-effective and efficient, helping us reach many young, tech-savvy respondents in Malaysia, who are a key segment of the target group. Only those with credit cards, personal loans, or both loans are targeted as respondents. Additionally, only those who are young (aged between 21 and 40) and earn low income (monthly income between RM2000 to RM 5000) are eligible to participate.

The survey includes the study's background, the research objectives, and the respondents' eligibility criteria. The survey incorporates questions related to types of over-indebtedness, behavioral biases, and socio-demographic particulars of the participants. Google Forms was used to record the responses. Participation was voluntary and confidential. They were informed that they were free to withdraw at any time. Written informed consent was obtained from participants for this data to be used for research purposes. Ethical approval was granted by the Universiti of Sains Malaysia Ethics Committee prior to undertaking this research. The ethical approval number is USM/JEPeM/21020157.

To ensure the validity of the scales used in this study within the Malaysian context, the questionnaire was refined for cultural relevance and accuracy. One academic expert in consumer finance reviewed it for clarity and alignment with local perspectives, while local names were incorporated into survey questions to enhance relatability. Additionally, a pilot study was conducted by distributing 30 questionnaires to young individuals with consumer debt. The refined questionnaire was subsequently used for data collection in the main study. A total of 468 responses were obtained, but only 433 valid responses were used for data analysis. Since convenience sampling was used to collect data, there is an inherent selection bias that may limit the sample's representativeness and affect the generalizability of the findings.

3.2. Behavioral biases measures

Overconfidence bias was measured as the individuals overestimating their debt literacy based on Lusardi and Tufano (2015) and Cwynar et al. (2020). It is estimated by measuring the respondents' actual debt literacy (OBLIT, for objective literacy) and their self-assessments of debt literacy (SUBLIT, for subjective literacy). The latter is a proxy for debt-related financial confidence (Cwynar et al., 2019; Salas, 2024). Objective debt literacy was measured using three questions related to compounding interest, years taken to pay off debt, and debt repayment options based on Lusardi and Tufano (2015). At the same time, subjective debt literacy was estimated based on respondents' assessment of their debt literacy using a 5-point Likert scale where 1 means a very low assessment of debt knowledge while 5 means a very high assessment of debt knowledge. In line with Porto and Xiao (2016) and Cwynar et al. (2020), respondents are classified as overconfident in debt literacy if their OBLIT $\leq$ sample mean and SUBLIT $>$ sample mean. This measure is coded as a binary variable where overconfidence $= 1$ and otherwise $= 0$.

Self-control bias was estimated using seven items from Strömbäck et al. (2017) and Tangney et al. (2004). This construct considers the individual's tendency to face difficulty in breaking bad habits, getting distracted easily, having problems resisting temptation, doing things for fun and regretting later, acting without thinking thoroughly, lacking self-discipline, and not being able to work effectively toward long-term goals. Self-control bias was assessed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A higher value was linked to a greater tendency to exhibit self-control bias. Mental accounting was measured using seven items from Antonides et al. (2011), Mahapatra and Mishra (2020) and Muehlbacher and Kirchler (2019). This construct takes into account the individual's likelihood of keeping track of their financial activities, which includes their earnings, expenses, and savings; classifying their expenses into different categories; not spending more than a fixed amount in each category; reducing expenditure on one category when spending more on another; not spending money kept for future investment and retirement. A five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to assess mental accounting, with the higher value being linked to the greater tendency to engage in mental accounting.

Meanwhile, availability bias was estimated using two items based on Eisenberg and Small (1993) and Kilborn (2005). The first question relates to whether the respondent thinks that more individuals have become bankrupt in recent years due to their inability to settle their consumer loans. It is measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The second question asks the respondents if they personally know individuals who have been declared bankrupt due to their inability to settle their consumer loans. It is measured using a binary scale with the response of either yes (1) or no (0). A higher value is linked to greater availability bias.

3.3. Over-indebtedness measures

Currently, there is no standardized method for measuring consumer over-indebtedness, though existing studies often rely on indicators such as overspending, unsustainable debt levels, or inability to repay as objective markers of over-indebtedness (Betti et al., 2007). Silva et al. (2024) asserts that individuals are considered over-indebted if they struggle to meet household obligations, including payments on secured or unsecured debt, rent, utilities, or other essential bills. Nevertheless, no consensus exists regarding the level above which an individual is classified as over-indebted. Additionally, the subjective measurement of over-indebtedness is estimated using consumers' own judgment of their actual financial difficulties. This study only uses the objective measurement of over-indebtedness. In line with Gathergood (2012), self-reported over-indebtedness is measured in this study based on consumers' inability to service debt. Measures of over-indebtedness used are one-month arrears, two-month arrears, and three-month arrears in credit card loans and personal loan repayment. This aligns closely with Malaysian lending practices, where a personal loan is typically classified as in default after 90 days of non-payment. By capturing arrears at these intervals, this study effectively reflects the progression towards default, providing a relevant and realistic assessment of financial distress within the local context. Based on the response, we construct three types of dependent variables.

First, we estimated the overall over-indebtedness using a binary variable equal to 1 if the respondents have incurred any arrears (one month, two months, or three months) in credit card loans, personal loans, or both loan repayments and 0 otherwise. Second, we include one binary variable for each type of arrears in credit card loans, personal loans, or loan repayments. This results in three over-indebtedness measures: one for one-month arrears, one for two-month arrears, and one for three-month arrears. Lastly, we estimated two separate over-indebtedness measures: one for any arrears in credit card loan repayments and one for any arrears in personal loan repayments.

3.4. Control variables

Existing studies by Ferreira et al. (2021) and Gutiérrez-Nieto et al. (2017) find that socioeconomic factors also influence over-indebtedness. In line with the literature, the standard socio-demographic and economic characteristics such as gender, age, income, educational attainment, marital status, and type of employment were included as the control variables in estimating consumer over-indebtedness. Additionally, we included financial literacy as a control variable, measured through three questions related to compound interest, time required to pay off debt, and debt repayment options, based on (Lusardi & Tufano, 2015). The scores were categorized as follows: a score of 0 indicated no knowledge (all answers incorrect), while a score of 1 indicated some knowledge (at least one correct answer).

3.5. The model

The main objective of this study is to identify the determinants of over-indebtedness. The dependent variables used in the study are binary variables. Logit regression was employed to analyse the linkages between over-indebtedness with behavioral biases and respondents' demographic characteristics. It was chosen over probit for its clarity in binary outcomes. Logit coefficients can be interpreted as odds ratios, making the effects on over-indebtedness easier to understand for consumer finance policy. Additionally, logit is less sensitive to extreme values, ensuring stable results that align well with the dataset's characteristics (Wooldridge, 2010).

The following logit model is used:

$$\text{Log}\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots + \beta_n X_n + \varepsilon \quad (1)$$

where P = the probability that a respondent is overindebted, 1 – P = the probability that a respondent is not overindebted, Log $(\frac{P}{1-P})$ = the log of the odds that a respondent is overindebted, β_0 = constant of the equation, β_i = the coefficient of the independent variables, X_i = the independent variable hypothesized to influence the probability, ε = the stochastic disturbance term of the regression, Logit (p) is the

log of the odds ratio p/(1 – p) or likelihood ratio in which the dependent variable is one. The form of the logistic regression is:

$$\text{logit } (p(x)) = \log\left(\frac{p(x)}{1-p(x)}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots + \beta_n X_n + \varepsilon \quad (2)$$

where p is the probability that a case is in a particular category. The logistic regression finds the best fitting equation using maximum likelihood which maximizes the probability of getting the observed results given the fitted regression coefficients. Logistic regression primarily shows correlation between the dependent binary variable and independent variables rather than causality.

4. Results

4.1. Descriptives

This study's respondents are categorised into four groups based on their debt repayment status. Most of the respondents (60.50%) are prompt in their loan repayments. The remaining respondents have one-month loan arrears (18.48%), two-month loan arrears (11.78%), and three-month arrears (9.24%).

Table 1 shows the respondents' socio-demographic characteristics and financial literacy based on the over-indebtedness type. On average, the percentage of female respondents with no arrears is slightly higher than that of male respondents. However, the percentage of male respondents with overall over-indebtedness is higher compared to female respondents. This shows that male borrowers are more likely to face problems settling their consumer loans than females. When it comes to the age category, we find that a higher percentage of respondents with no debt overdue belong to the 31 to 40 age group.

Similarly, a higher percentage of respondents with overall over-indebtedness also belong to the same age category. As for the income category, we find that the greater percentage of respondents with no arrears and overall over-indebtedness belongs to the lower income category (RM2000 to RM3000). However, a lower percentage of respondents with no arrears and overall over-indebtedness belongs to the higher income category (RM4001 to RM5000). When it comes to educational background, we find that a lower percentage of the respondents in both categories belong to the no degree category. It is observed that the percentage of respondents with no arrears who work in the public sector is almost three times that of the private sector. Meanwhile, the percentage of respondents with overall over-indebtedness is slightly higher in the private sector than in the public. Lastly, a larger percentage of respondents lack financial knowledge. Among those with no financial knowledge, a higher proportion

Table 1. Sample profile based on types of over-indebtedness.

	Type of over-indebtedness				
	No arrears	One-month arrears	Two-month arrears	Three-month arrears	Total
Variables					
Gender					
Male	47.29	51.25	56.86	55	49.42
Female	52.71	48.75	43.14	45	50.58
Age					
Age 21 to 30	37.91	38.75	41.18	35	38.56
Age 31 to 40	62.09	61.25	58.82	65	61.43
Income					
Monthly income RM2000 to RM3000	54.51	45	56.86	77.5	54.97
Monthly income RM3001 to RM4000	30.69	35	31.37	15	29.79
Monthly income RM4001 to RM5000	14.8	20	11.76	7.5	15.24
Education					
Diploma and lower	76.53	76.25	70.58	72.5	75.29
Degree and above	23.47	23.75	29.41	27.5	24.71
Marital status					
Single	40.79	36.25	35.29	40	38.57
Married	59.21	63.75	64.71	60	61.43
Employment					
Private sector employment	27.44	48.75	54.9	60	36.72
Public sector employment	72.56	51.25	45.1	40	63.28
Financial Literacy					
No knowledge	63.54	57.5	54.9	62.5	61.2
Some knowledge	36.46	42.5	45.1	37.5	38.8

Table 2. Descriptive statistics of behavioral biases by types of over-indebtedness.

	Observation	Mean	Standard deviation	Minimum	Maximum
Type of biases					
No arrears					
Overconfidence	262	0.177	0.382	0	1
Self-control bias	262	2.753	0.549	1.286	4.571
Availability bias	262	2.238	0.526	0.500	3
Mental accounting	262	3.725	0.662	1.143	5
One month arrears					
Overconfidence	80	0.088	0.284	0	1
Self-control bias	80	3.023	0.488	1.857	3.857
Availability bias	80	2.131	0.532	0.500	3
Mental accounting	80	3.571	0.588	1.857	5
Two month arrears					
Overconfidence	51	0.039	0.196	0	1
Self-control bias	51	3.076	0.547	1.429	4.143
Availability bias	51	2.196	0.592	1	3
Mental accounting	51	3.501	0.668	2	4.857
Three month arrears					
Overconfidence	40	0.100	0.304	0.000	1
Self-control bias	40	3.211	0.484	1.429	4
Availability bias	40	2.388	0.560	0.500	3
Mental accounting	40	3.379	0.620	2.143	5
Credit card arrears					
Overconfidence	51	0.098	0.300	0	1
Self-control bias	51	3.594	0.542	2.143	4.857
Availability bias	51	3.073	0.472	2	4.143
Mental accounting	51	2.363	0.388	1.5	3
Personal loan arrears					
Overconfidence	50	0.060	0.240	0	1
Self-control bias	50	3.563	0.612	2.143	5
Availability bias	50	2.991	0.568	1.429	4
Mental accounting	50	2.030	0.593	0.5	3

have arrears in the one-month, two-month, and three-month categories. In contrast, individuals with some financial literacy have a lower percentage of no arrears and higher arrears in all categories compared to those with no financial knowledge.

Table 2 summarizes the average score of the behavioral bias variables based on different types of over-indebtedness. The average score for overconfidence bias is highest among those with no debt overdue and lowest among those with two-month arrears. The self-control bias score is highest among those with three-month loan overdue and lowest among those with no loan overdue. Moreover, we observe that those who are prompt in their loan repayments have the highest mental accounting score, while the opposite is true for those with three-month loan overdue. The availability bias score is highest among those with three months of loan arrears and lowest among those with one month of loan arrears. When differentiation is made between credit card and personal loan over-indebtedness, it is observed that the overconfidence bias score is higher for the former compared to the latter. Self-control bias score is high for both types of loans. At the same time, availability bias and mental accounting bias scores are higher for respondents with credit card over-indebtedness than those with personal loan over-indebtedness.

4.2. Regression analyses

Table 3 presents the logistic regression results for the factors associated with overall over-indebtedness, defined by one-month, two-month, and three-month arrears in credit card or personal loan repayments. Four sets of analyses were conducted, each focusing on different types of behavioral biases. The results suggest that there are significant associations between behavioral biases, gender, marital status, and employment status, and the likelihood of an individual being over-indebted. Specifically, the results in column 2 indicate a reduced likelihood of over-indebtedness among more overconfident individuals. Similarly, column 4 reveals a lower likelihood of over-indebtedness among individuals with higher mental accounting scores. Conversely, the result in column 6 indicates a significantly higher likelihood of over-indebtedness among individuals with higher self-control bias. Availability bias, however, is not significantly associated with over-indebtedness. Furthermore, male respondents are more likely to be over-

Table 3. Factors associated with overall over-indebtedness.

Variables	(1) Coeff	(2) Odds Ratio	(3) Coeff	(4) Odds Ratio	(5) Coeff	(6) Odds Ratio	(7) Coeff	(8) Odds Ratio
Overconfidence	−0.850**	0.427**						
	(0.353)	(0.151)						
Mental Accounting			−0.465***	0.628***				
			(0.168)	(0.105)				
Self-control Bias					1.251***	3.495***		
					(0.232)	(0.812)		
Availability Bias							0.041	1.042
							(0.201)	(0.209)
Financial Literacy	0.014	1.014	0.111	1.118	0.201	1.222	0.121	1.129
	(0.158)	(0.160)	(0.156)	(0.174)	(0.162)	(0.198)	(0.153)	(0.172)
Gender	0.386*	1.470*	0.387*	1.473*	0.370	1.448	0.384*	1.469*
	(0.221)	(0.325)	(0.221)	(0.325)	(0.232)	(0.336)	(0.219)	(0.322)
Marital Status	0.495**	1.640**	0.549**	1.732**	0.594**	1.810**	0.464**	1.590**
	(0.237)	(0.389)	(0.239)	(0.414)	(0.244)	(0.442)	(0.234)	(0.372)
Age 31 to 40	0.114	1.121	0.120	1.128	0.076	1.079	0.134	1.143
	(0.252)	(0.283)	(0.253)	(0.285)	(0.264)	(0.285)	(0.249)	(0.285)
Degree and above	−0.015	0.986	−0.001	0.999	−0.056	0.945	0.019	1.019
	(0.255)	(0.251)	(0.260)	(0.259)	(0.271)	(0.256)	(0.255)	(0.260)
Monthly income RM3001 to RM4000	−0.097	0.908	−0.137	0.872	0.012	1.012	−0.115	0.891
	(0.251)	(0.228)	(0.253)	(0.221)	(0.261)	(0.264)	(0.249)	(0.222)
Monthly income RM4001 to RM5000	−0.285	0.752	−0.297	0.743	−0.130	0.878	−0.307	0.736
	(0.339)	(0.255)	(0.346)	(0.257)	(0.350)	(0.307)	(0.342)	(0.252)
Public sector employment	−1.284***	0.277***	−1.254***	0.285***	−1.377***	0.252***	−1.284***	0.277***
	(0.244)	(0.068)	(0.244)	(0.070)	(0.257)	(0.065)	(0.242)	(0.067)
Constant	−0.200	0.819	1.282**	3.605**	−4.068***	0.017***	−0.442	0.643
	(0.259)	(0.212)	(0.648)	(2.336)	(0.744)	(0.013)	(0.477)	(0.306)
LR	36.97		39.06		57.1		33.2	
Pseudo R^2	0.078		0.081		0.133		0.067	
Hosmer–Lemeshow	6.66		6.18		9.68		7.62	
Prediction accuracy	70.90%		69.75%		72.52%		70.90%	
Observations	433		433		433		433	

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

indebted than female respondents. Married individuals are more likely to be over-indebted than their single counterparts. Lastly, the findings suggest that individuals employed in the public sector are less likely to be over-indebted.

Further analyses were conducted by segregating over-indebtedness based on the number of months in arrears and types of loans. The findings presented in Table 4 suggest that a higher self-control bias score increases the likelihood of being in one-month, two-month, and three-month arrears and over-indebted on credit cards and personal loans. Additionally, the results confirm that working in the public sector lowers the likelihood of all types of over-indebtedness.

On the other hand, the results in column 2 of the logistic regression analysis suggest that a higher availability bias score is associated with a lower likelihood of being in one-month arrears. Additionally, individuals earning RM3001 to RM4000 and RM4001 to RM5000 have 1.93 times and 2.15 times higher likelihood of being in one-month arrears compared to those earning less than RM3000. Meanwhile, the results in column 6 show that a higher mental accounting score is associated with a lower likelihood of being in three-month arrears, whereas a higher availability bias score increases this likelihood. Those with higher income have less likelihood on being in three-month arrears. The results in column 8 confirm that availability bias is positively associated with credit card over-indebtedness. In addition, male respondents and those who belong to the 31 to 40 age categories are more likely to have credit card arrears. Results in column 10 confirm that married individuals are more likely to be in personal loan arrears.

In line with Gathergood (2012), additional analyses are done considering individual ability to keep up with their credit commitments. A score of 0 indicates no difficulties in meeting all bills and commitments, while a score of 1 reflects occasional struggles despite keeping up. A score of 2 signifies consistently managing bills but with significant challenges, whereas a score of 3 indicates falling behind on some bills or credit obligations. Finally, a score of 4 represents severe financial difficulties, with many bills or commitments in arrears. Results in columns 1 and 2 of Table 5 show that self-control bias and availability bias are linked to greater inability to keep up with credit commitments, while mental

Table 4. Factors associated with one month, two months, three months, credit card and personal loan over-indebtedness.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	One Month Arrears		Two Month Arrears		Three Month Arrears		Credit Card Overindebtedness		Personal Loan Overindebtedness	
Variables	Coeff	Odds Ratio	Coeff	Odds Ratio	Coeff	Odds Ratio	Coeff	Odds Ratio	Coeff	Odds Ratio
Overconfidence	−0.467	0.627	−1.200	0.301	0.101	1.106	−0.116	0.890	−0.693	0.500
	(0.444)	(0.278)	(0.770)	(0.232)	(0.611)	(0.676)	(0.405)	(0.361)	(0.439)	(0.220)
Mental Accounting	0.134	1.144	−0.157	0.855	−1.026***	0.358***	−0.351	0.704	−0.217	0.805
	(0.226)	(0.259)	(0.267)	(0.228)	(0.343)	(0.123)	(0.220)	(0.155)	(0.224)	(0.180)
Self-control Bias	0.829***	2.290***	0.766**	2.150**	1.070**	2.916**	1.013***	2.753***	0.909***	2.481***
	(0.257)	(0.588)	(0.336)	(0.723)	(0.422)	(1.232)	(0.244)	(0.671)	(0.278)	(0.689)
Availability Bias	−0.507**	0.602**	−0.006	0.994	1.274**	3.574**	0.433*	1.542*	−0.183	0.833
	(0.250)	(0.150)	(0.339)	(0.336)	(0.508)	(1.816)	(0.255)	(0.392)	(0.261)	(0.217)
Financial Literacy	0.043	1.044	0.156	1.169	−0.162	0.850	0.082	1.086	−0.157	0.855
	(0.182)	(0.190)	(0.209)	(0.244)	(0.283)	(0.240)	(0.176)	(0.191)	(0.185)	(0.158)
Gender	0.104	1.110	0.531	1.701	0.404	1.497	0.483*	1.621*	0.293	1.341
	(0.267)	(0.296)	(0.328)	(0.558)	(0.378)	(0.566)	(0.250)	(0.406)	(0.270)	(0.362)
Marrital Status	0.120	1.128	0.356	1.428	0.336	1.399	−0.178	0.837	0.734**	2.083**
	(0.276)	(0.311)	(0.347)	(0.496)	(0.432)	(0.605)	(0.255)	(0.214)	(0.287)	(0.597)
Age 31 to 40	−0.022	0.978	0.024	1.024	0.714	2.043	0.675**	1.964**	−0.158	0.854
	(0.322)	(0.315)	(0.396)	(0.406)	(0.445)	(0.909)	(0.311)	(0.611)	(0.309)	(0.264)
Degree and above	−0.382	0.683	0.093	1.097	0.160	1.174	0.311	1.365	−0.151	0.860
	(0.318)	(0.217)	(0.335)	(0.367)	(0.415)	(0.487)	(0.276)	(0.377)	(0.307)	(0.263)
Monthly income RM3001 to RM4000	0.658**	1.930**	0.084	1.088	−1.264**	0.283**	−0.036	0.964	−0.016	0.984
	(0.310)	(0.598)	(0.341)	(0.370)	(0.538)	(0.152)	(0.294)	(0.283)	(0.291)	(0.287)
Monthly income RM4001 to RM5000	0.768**	2.154**	−0.546	0.579	−1.714**	0.180**	−0.060	0.942	−0.734	0.480
	(0.388)	(0.837)	(0.567)	(0.328)	(0.747)	(0.135)	(0.356)	(0.336)	(0.448)	(0.215)
Public sector employment	−0.674**	0.510**	−0.993***	0.370***	−1.616***	0.199***	−0.825***	0.438***	−1.658***	0.190***
	(0.306)	(0.156)	(0.351)	(0.130)	(0.427)	(0.085)	(0.279)	(0.122)	(0.299)	(0.057)
Constant	−3.224***	0.040***	−3.636**	0.026**	−4.368**	0.013**	−4.007***	0.018***	−1.932	0.145
	(1.223)	(0.049)	(1.451)	(0.038)	(1.769)	(0.022)	(1.192)	(0.022)	(1.217)	(0.176)
LR		28.4		21.63		51.26		43.36		63.89
Pseudo R^2		0.0655		0.0862		0.2141		0.1085		0.1547
Hosmer–Lemeshow		7.13		7.24		6.39		10.6		13.97
Prediction accuracy		81.76%		88.22%		91.69%		75.75%		79.45%
Observations	433	433	433	433	433	433	433	433	433	433

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5. Factors associated with alternative measures of over-indebtedness.

	(1)	(2)	(3)	(4)
	Keep up with credit commitments		Self-reported over-indebtedness	
Variables	Coeff	Odds ratio	Coeff	Odds ratio
Overconfidence	0.957	−0.044	0.804	−0.219
	(0.318)	(0.332)	(0.510)	(0.634)
Mental accounting	0.671**	−0.400**	0.555	−0.590
	(0.121)	(0.180)	(0.228)	(0.410)
Self-control bias	3.198***	1.162***	1.281	0.247
	(0.735)	(0.230)	(0.522)	(0.408)
Availability bias	1.732**	0.549**	3.140*	1.144*
	(0.383)	(0.221)	(1.931)	(0.615)
Financial literacy	1.023	0.023	0.601	−0.510
	(0.162)	(0.158)	(0.281)	(0.467)
Gender	1.691**	0.525**	2.291	0.829
	(0.367)	(0.217)	(1.161)	(0.507)
Marital status	1.623**	0.484**	1.432	0.359
	(0.373)	(0.230)	(0.783)	(0.547)
Age 31 to 40	0.940	−0.061	1.333	0.287
	(0.227)	(0.242)	(0.714)	(0.536)
Degree and above	0.929	−0.073	1.682	0.520
	(0.223)	(0.240)	(0.773)	(0.459)
Monthly income RM3001 to RM4000	1.309	0.269	0.132***	−2.027***
	(0.318)	(0.243)	(0.092)	(0.697)
Monthly income RM4001 to RM5000	0.900	−0.105	0.375	−0.980
	(0.302)	(0.336)	(0.249)	(0.662)
Public sector employment	0.607**	−0.500**	0.259***	−1.353***
	(0.139)	(0.229)	(0.128)	(0.496)
Constant	0.042***	−3.175***	0.030**	−3.491**
	(0.043)	(1.025)	(0.047)	(1.548)
LR	52.38		33.39	
Pseudo R^2	0.112		0.165	
Hosmer–Lemeshow	11.01		8.66	
Prediction accuracy	66.74%		93.30%	
Observations	433		433	

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

accounting is linked to greater ability to keep up with credit commitments. Gathergood (2012) classifies individuals as self-reportedly over-indebted if they experience severe financial difficulties, characterized by numerous bills or commitments in arrears (a score of 4). In line with this approach, further analysis categorizes individuals who self-report as over-indebted as 1, with all others categorized as 0. Only 6.46% of the sample is classified as self-reportedly over-indebted, compared to 36% of those who have fallen into arrears (ranging from one to three months) on credit card loans or personal loans. The results presented in columns 3 and 4 indicate that availability bias is linked to higher levels of self-reported over-indebtedness.

4.3. Discussion of results

Self-control bias individuals have a higher possibility of having a one-month, two-month, and three-month credit card and personal loan arrears. These findings provide support to hypothesis 1. These findings suggest that individuals with higher self-control bias are more likely to struggle with managing their debts and are consequently more prone to falling behind on repayments across different types of loans. The finding that self-control bias is positively associated with over-indebtedness among Malaysian consumers aligns with similar observations in the United States (Meier & Sprenger, 2010), the United Kingdom (Gathergood, 2012) and Spain (Fernández-López et al., 2024). This consistency can be justified by the universal nature of self-control bias, which affects financial behavior regardless of the economic context. Adzis et al. (2017) mentions that Malaysia's high indulgence score, compared to other Southeast Asian countries, reflects a cultural emphasis on leisure and discretionary spending. This inclination supports the role of self-control bias in driving debt levels among young Malaysians, as it aligns with a tendency for immediate gratification over financial restraint. Additionally, the proliferation of credit products and consumerism in both contexts can exacerbate the impact of self-control bias, making it a significant predictor of over-indebtedness worldwide.

Overconfidence bias lowers the possibility of overall over-indebtedness, providing partial support to hypothesis 2. These findings imply that overconfident individuals, due to their strong belief in their financial management abilities, are more careful in handling their finances, which helps them avoid excessive debt and maintain timely repayments. In Malaysia, the credit market might be less complex than developed countries, and overconfidence may lead to more cautious borrowing behavior, reducing the likelihood of over-indebtedness. This behavior could be more pronounced in general consumer debt, where individuals may have more control and flexibility over their spending and repayment plans compared to the structured nature of mortgage debt (Kim et al., 2020) and overall debt (Cwynar et al., 2020). The financial markets in developed countries are more mature and diverse, offering a more comprehensive range of credit products. Overconfident individuals in these settings may overestimate their ability to manage such sophisticated debt, leading to higher over-indebtedness. Cultural factors might promote more prudent financial behavior, even among overconfident individuals in Malaysia.

Additionally, this study finds that mental accounting reduces the possibility of overall over-indebtedness and three-month arrears, supporting hypothesis 3. The results imply that consumers in Malaysia manage debt more effectively by treating credit as distinct budget categories. Meanwhile, a study by Gelman and Roussanov (2024) in a developed country reports that mental accounting does not increase consumer debt. Although consumers increase spending, they do not accrue additional debt when viewing a new credit card as a separate budget. These findings indicate that while mental accounting helps contain debt across contexts, cultural and economic factors in Malaysia may enhance its impact, promoting disciplined borrowing practices that mitigate over-indebtedness risks.

Finally, this study finds that availability bias does not affect overall over-indebtedness. However, it reduces the likelihood of being in one-month arrears while increasing the likelihood of three-month arrears and credit card arrears. These findings partially support Hypothesis 4. These findings imply that individuals who are more aware of bankruptcy events and know individuals who have been declared bankrupt are more vulnerable to greater over-indebtedness and credit card over-indebtedness. The findings show that familiarity with over-indebtedness leads individuals to overestimate the likelihood of experiencing financial difficulties, which results in poor financial decisions in managing debt[1].

5. Conclusion and policy recommendations

The central research question of this study is to explore the extent to which self-control bias, overconfidence, mental accounting, and availability bias contribute to over-indebtedness among young, low-income Malaysians. Our findings indicate that self-control bias significantly increases the likelihood of all types of over-indebtedness, suggesting that individuals with poor self-control are more prone to accumulating debt. In contrast, overconfidence and mental accounting are associated with lower overall levels of over-indebtedness, implying that individuals with these biases may underestimate the need for excessive borrowing or may manage their finances in a way that limits debt accumulation. However, availability bias was found to worsen credit card debt repayment decisions, indicating that individuals influenced by this bias may overestimate their ability to manage debt and thus make poorer repayment choices, especially with credit cards. These results highlight the complex role of behavioral biases in influencing the accumulation of debt among young, low-income Malaysians. Since emotional or cognitive factors drive these biases, consumers need to be able to manage these factors to achieve better debt repayment decisions. Greater self-control needs to be practiced to improve their debt repayment decisions. The findings of this study show that the positive emotion of having greater financial confidence needs to be facilitated as it augurs well for debt repayment. Additionally, consumers should engage more in mental accounting as it facilitates their debt repayment decisions. Consumers need to be exposed to the consequences of over-indebtedness to be aware of its negative impact.

Policymakers must recognize the influence of emotional and cognitive factors on consumers' debt repayment behaviors to effectively address over-indebtedness. Improving self-control, particularly among younger consumers, can be achieved through targeted financial education programs designed to enhance both financial knowledge and practical skills Grohmann and Hamdan (2021). This could be achieved through comprehensive educational programs that not only provide foundational financial knowledge but also emphasize practical skills, such as mental accounting, budgeting, and expense

prioritization. For instance, financial education initiatives should include workshops on creating and adhering to monthly budgets, distinguishing between essential and discretionary expenses, and implementing techniques to resist impulsive spending. In addition, policymakers should introduce incentive-based programs that reinforce positive financial behaviors by rewarding consumers who demonstrate responsible financial management, such as consistently saving or repaying debt on time. These incentives might take the form of tax credits, cash rewards, or access to lower-interest financial products, offering tangible benefits for prudent financial behavior.

Furthermore, accessible financial counseling and debt management services play a critical role in supporting individuals struggling with debt, particularly those affected by cognitive biases like availability bias, which can hinder effective repayment strategies. Expanding access to such services would provide consumers with personalized guidance and resources, such as structured debt repayment plans and ongoing financial coaching. These services can help individuals build financial resilience, make informed decisions, and navigate the psychological challenges associated with debt, contributing to long-term financial stability.

This study focused on respondents who were young and belonged to the low-income category. Future studies should include respondents from other categories. This study has only analysed the relationship between four types of behavioral biases and over-indebtedness. Future studies should explore more behavioral biases that are linked to over-indebtedness to get a better understanding of the topic. Future studies should consider such differentiation to get a better perspective on the effect of mental accounting on debt repayment behavior. By focusing only on consumers in a single country, the findings of this study may be influenced by some cultural elements present within the society (Rey-Ares et al., 2021). Future studies should be more comprehensive by including consumers from different countries. Additionally, due to the observational nature of our study and the limitations of logistic regression, we cannot establish a causal relationship between the dependent and the independent variables. Further research employing experimental or longitudinal designs would be necessary to determine causality.

Note

1. Lack of studies have directly tested the effect of availability bias on debt repayment behavior in developed countries.

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About the author

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Data availability statement

Data supporting the findings of this study are available upon request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions. Researchers interested in accessing the data will need to comply with the ethical guidelines governing the use of these data.

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