BEHAVIORAL BIASES AND CREDIT CARD REPAYMENTS AMONG MALAYSIANS

[1]Fazelina Sahul Hamid & [2]Siti Haslina Md Harizan
[1]Bristol Business School
University of the West of England, United Kingdom
[2]School of Distance Education, Universiti Sains Malaysia

[1]Corresponding author: Fazelina.SahulHamid@uwe.ac.uk

ABSTRACT

Analyses done using the survey response of 451 credit cardholders in the northern region of West Malaysia have shown that credit cardholder repayment pattern differed based on their demographic profile. Specifically, the study found that credit cardholders who were younger and earned a lower income tended to make poorer repayment decisions. In contrast, those with higher academic qualifications tended to make better repayment decisions. Further analyses also revealed that behavioral biases were better at predicting those who made full payment of the outstanding balance and those who paid more than the minimum amount, but failed to predict those who only paid the minimum amount or less. In addition, it was found that overspending emerged as the strongest predictor which discriminated among the three repayment groups, followed by risk aversion, myopia and impulsiveness.

INTRODUCTION

Household debt-to-gross domestic product (GDP) in Malaysia remains the highest among ASEAN countries. The high level of household debt has become a major concern in Malaysia because the growth of disposable income is slowing down and the economic condition is less favorable (World Bank, 2019). Economic analysts and policymakers are concerned about this situation, given the potential risk it may pose to the stability of the financial system and economic growth. One of the issues that have become a growing concern in Malaysia is the rising credit card loans over the years. A credit card provides consumers with easy access to credit for consumption. Credit cardholders can shop without having enough cash with them. This may lure consumers to spend more than what is necessary and live beyond their means (Soman, 2001). The convenience of using a credit card can lead to the problem of massive debt accumulation. Borrowing more makes consumers vulnerable to bankruptcies and credit market exclusion (Gathergood, 2012).

Increasingly, the younger generation and low-income individuals in Malaysia are turning to credit card loans for discretionary consumptions that are aimed at supporting extravagant lifestyle choices rather than on necessities (World Bank, 2019). Unlike other loans that require collaterals and fixed settlements, the credit card loan is a revolving loan that is offered based on an individual's income category. Consumers are only required to make minimum payments of five percent of the outstanding amount due every month. Given that credit card loans are often very costly, consumers may rapidly go into debt and face financial hardship if they are not able to settle their loans. Data released by the Credit Counselling and Debt Management Agency (AKPK) shows that the credit card debt accounted for 55 percent of the total debt portfolio mediated by the agency (The Malaysian Reserve, 2019). Bankruptcies related to credit card loans have also increased sharply over the years, especially among the younger generation (World Bank, 2019). This raises the question of

why Malaysians are incurring debts they could not afford and given the known dangers of excessive borrowing.

Traditional theories in finance like the Capital Asset Pricing Model (CAPM) and the Miller-Modigliani theorem assume that individuals make portfolio allocation based on a trade-off between expected return and risk. These theories assume that individuals are rational decision-makers who make well-informed decisions that maximize their utility. However, empirical evidence shows that consumers do not always make rational decisions. Behavioral finance posits that decision making by individuals is bounded because of inadequate resources and the lack of ability (Sharma & Kumar, 2019). These lead to judgmental errors and suboptimal decision making that can be detrimental for individuals and society (Ceschi et al., 2019). As far as borrowing is concerned, most of the microeconomic theories posit that individuals borrow to smooth their consumption over the life cycle. Even though debt allows consumers to improve their standard of living by leveraging on their future income, over-indebtedness becomes a concern because individuals must use much of their current income to settle their debt (Gathergood, 2012). As a result, they may not have enough funds for expenditure and savings. This impairs their financial well-being and makes it difficult for them to cope with unforeseen financial shocks due to illness, emergencies or job loss.

Existing studies on credit card debt in Malaysia have mainly focused on macroeconomic factors (Theong et al., 2018); attitude (Ramayah et al., 2002; Chong, 2017); cardholders attributes (Wei et al., 2018); financial knowledge (Jusoh & Lin, 2012), financial literacy (Hamid & Loke, 2021a) and demographic profile (Loke et al., 2011). Despite the increasing volume of research on credit card loans in Malaysia, not many of these previous studies have investigated the link between behavioral biases and credit card repayment. Existing studies on behavioral biases in Malaysia have focused on trading and investment in the stock market (Hamid et al., 2013; Brahmana et al., 2015; Jaiyeoba et al., 2020) and asset management industry (Ahmad et al., 2018).

This study aims to fill this research gap and add to the literature by identifying the differences in credit card repayments based on the demographic profiles of the users. Additionally, this study establishes the link between behavioral biases and credit card repayment. The

findings of this research can help identify the characteristics of vulnerable credit card users and the behavioral biases that they are prone to. In doing so, the present study will enable policymakers and credit card providers to plan for a better card credit risk management framework that can assist vulnerable borrowers to improve their financial decision making. This is in line with the Bank Negara Malaysia (BNM)'s aim of strengthening household resilience and financial stability.

LITERATURE REVIEW

Behavioral economics postulates that consumers are not always rational in their financial decision making. Behavioral biases that have been studied include risk aversion, mental accounting, regret avoidance, overconfidence, naive expectations, myopia, lack of self-control and procrastination (Barberis & Thaler, 2003; Ceschi et al., 2019). The existing literature has used behavioral biases in explaining various financial decision making, such as stock market anomalies (Barberis & Thaler, 2003), excessive risk-taking (Hamid et al., 2013), over-indebtedness (Gathergood, 2012; Barboza, 2018) and delayed repayments (Barboza et al., 2017; Barboza, 2018). The latter is true for credit card loans that give consumers the flexibility to decide how much to repay.

Shefrin and Thaler (1981) includes self control to the model of intertemporal choice in the theory of rational behavior. They illustrate that individuals who are myopic (doers) care only about instant gratification. Meanwhile, the planners care about the consumers' present and future. They show that a consumer's myopic perspective usually results in less constant outcome compared to a farsighted perspective. In the context of a competitive credit market, Heidhues and Koszegi (2010) demonstrate that self-control bias influences consumer to borrow more and delay repayments, which results in large welfare losses. Meanwhile, (Baumeister, 2002) defines self-control bias as the individuals' lack of ability to regulate their cognition, emotion, behavior and responses. Individuals with a self-control bias are more impatient in the short-run compared to long-run. As a result, they prefer instant gratification and are more concerned about their present than the future. The existing literature has linked self-control bias to dimensions related to impulsiveness, overspending, myopia and risk-taking.

Existing studies show that credit card repayments vary according to the demographic profiles of the cardholders. Barboza (2018) finds that older individuals and those with higher educational attainment make better credit card repayment decisions. Stavins (2020) observes that the credit card holders tendency to be a revolve payment is influenced by their demographic characteristics such as age, income, gender, race, education and employment status. Wang et al. (2011) and Wang et al. (2011) shows that males are more likely to be revolve payment Hamid and Loke (2021b) finds that those with higher income make better credit card repayments. In line with this, the following hypothesis was derived:

Hypothesis 1: There is a significant relationship between the demographic profile of credit cardholders and credit card repayments.

Impulsiveness is identified as a personality trait that is associated with the immediate gratification of desires and needs that lacks consideration for long-term consequences. Within the behavioral finance research literature, impulsive buying behavior is associated with a lack of self-control. Baumeister (2002) defines it as the unplanned, spontaneous and irresistible buying behavior that happens without proper consideration about whether it is consistent with the individual's long-term goals. Impulsive individuals take more risk. In line with this, impulsive buying behavior has been linked to credit card usage (Baumeister, 2002). Pirog and Roberts (2007) confirm that impulsiveness is linked to credit card misuse. Gerardi et al. (2010) and Brown and Graf (2013) have provided empirical evidence that impulsiveness is associated with a greater tendency to obtain consumer loans. Limerick and Peltier (2014) find that credit cardholders who are impulsive have a higher debt. Peltier et al. (2013) find that impulsive buying behavior leads to a greater credit card debt among young individuals. Similarly, the present study expects impulsiveness to be linked to a worse credit card repayment pattern.

The 'pain of payment" is felt more when payment for goods and services are made using cash. Purchases made using credit cards are often settled later. As a result, individuals have a greater tendency to spend more than what they can pay in a period because of the availability of credit cards. Soman (2001) associates credit card usage to overspending behavior. Overspending using a credit card is attributed

to psychological and social factors (Sotiropoulos & D'Astous, 2012). Empirical evidence shows that there is a link between overspending behavior and credit card usage among consumers in the United Kingdom and Taiwan (Lo & Harvey, 2011). A similar association is also noticed in the Unites States (Huebner et al., 2018). Meanwhile, Barboza et al. (2017) find that overspending also leads to poor credit card repayment behavior among college students in the United States. The present study also expects overspending to be related to a worse credit card repayment pattern.

Myopia is another form of self-control bias whereby individuals are more focused on their short-term rather than long-term benefits (Sunstein, 2006). As a result, myopic individuals make decisions that are detrimental to their wellbeing over time. Among the behaviors that are linked to myopia are excessive borrowing, lack of saving, overeating, drinking alcohol and smoking. Brown and Graf (2013) confirm that myopic individuals have a higher tendency not to invest in the financial market. Also, they consume more now and delay retirement saving (Chybalski & Marcinkiewicz, 2018). Meier and Sprenger (2010) find that myopic individuals usually have a credit card and carry a higher credit card debt. Similarly, Kuchler and Pagel (2018) observe that myopic individuals are more likely to delay their credit card debt repayments. In line with this, the present study expects myopia to be linked to a worse credit card repayment pattern.

Risk-taking relates to the extent an individual is willing to be exposed to an uncertain outcome that may result in financial gains or losses. It varies among individuals. Barlow (1991) has identified risk-taking as one of the dimensions of self-control bias. Studies show that risk-taking behavior influences financial decision making. Brown and Graf (2013) find that risk-averse individuals have a higher tendency to not invest in the financial market, but have retirement savings. Hamid et al. (2013) and Pak and Mahmood (2015) confirm that individuals who have a higher risk-taking tendency are more likely to invest in risky assets. Risk-taking behavior has also been associated with intention to use a credit card and the possibility of overusing it (Lin et al., 2015). Palan et al. (2011) have pointed out that a higher level of risk-taking is associated with the incidence of greater credit card misuse. In line with this, the present study expects risk aversion to be associated with better credit card repayment. In line with the above arguments, the following hypothesis was derived:

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Hypothesis 2:   There is a significant relationship between behavioural biases and credit card repayments.

There is a dearth of literature examining the role of behavioral bias in influencing credit card debt in Malaysia. Theong et al. (2018) studied the effect of macroeconomic uncertainties on credit card default in Malaysia. Chong (2017) scrutinized the role of attitude towards credit, dependability, image consciousness and financial planning in influencing credit card repayment among Malaysians. Whereas, Chin et al. (2017) analysed the impact of personal attitude and spending pattern on credit card repayment pattern among academicians in Malaysia. Jusoh and Lin (2012) investigated the role demographic profile, financial knowledge and financial attitude in influencing credit card practices. Teoh et al. (2013) looked at how credit cardholders spending habits vary based on cardholders' demographic profiles, attitudes toward money, benefits given by banks, and accommodative bank policies. Meanwhile, Loke et al. (2011) studied the role of demographic factors related to age, race, education, income, number of loan commitments, household size and current account ownership in influencing credit card ownership. Hamid and Loke (2021a) investigated the role of financial literacy and money management skills in influencing credit card repayments in Malaysia. This study aims to fill the gap in the literature by looking at the role of behavioral biases in influencing credit card repayments.

METHODOLOGY

Data for this study were collected using a self-administered survey. A total of 500 questionnaires were distributed, and 451 completed questionnaires were used for the analysis. Data were collected in the northern region of West Malaysia. Only credit card users who had made payment decisions took part in the study. The questionnaire contained questions on demographic profile, and behavioral biases related to credit card usage and repayment practices. The latter was the dependent variable of this study. It was measured using a categorical scale. This variable was used to assess credit card repayment behavior, with 1 = pay in full, 2 = pay more than minimum and 3 = pay only minimum or less than minimum.

In line with the literature, the four dimensions of self-control bias relevant in understanding credit card repayments have been identified

as impulsiveness, overspending, myopia and risk aversion. In line with Brown and Graf (2013), impulsiveness is measured by identifying the individual's response to the following statement: "I am impulsive and tend to buy things that I cannot afford". This item was measured using a five-point Likert scale ranging from 1= "agree" to 5 = "don't agree". Following Barboza et al. (2017), overspending is measured by identifying the individual's tendency to purchase items using a credit card, knowing that they will not have enough money to pay their bill in full when the balance is due. A five-point Likert scale ranging from 1= "never" to 5 = "always" is used.

Meanwhile, myopia refers to individuals' tendency to be more concerned about their short-term gain rather than long-term ones. Following Brown and Graf (2013), this variable is assessed using the following statement: "I live for the present and don't think about my financial future. This item was measured using a five-point Likert scale ranging from 1= "agree" to 5 = "don't agree". Risk aversion refers to the self-assessment of risk that individuals are willing to take in their financial investment. In line with Grund and Sliwka (2010) and Brown and Graf (2013), this item was measured using a five-point Likert scale ranging from 1= "no risk" to 5 = "high risk". This study also considers the demographics variables to account for differences in respondents' gender, age, income, academic qualification, race and marital status. T-test and Analysis of Variance (ANOVA) were used in testing Hypothesis 1. Whereas, discriminant analysis was used to find support for Hypothesis 2.

Discriminant analysis has been performed by Combrink and Lew (2020) in examining the relationships among underdog bias, overconfidence and risk propensity in investor decision-making behavior. Hamid and Loke (2021a) which investigated the relationship between socio-economic factors, financial literacy, money management skill, overspending and impulsiveness on credit card repayment decisions also used discriminant analysis. The advantages of using such a model is that it enables one to predict membership in two or more mutually exclusively groups. In the context of the present study, it is the relationship between those who made full payment of the outstanding balance, paying more than the minimum amount. and paying the minimum amount or less. Discriminant analysis will also enable the creation of a regression equation that makes use of a

dependent (criterion) variable that is discrete rather than continuous. Based on the preexisting data in which group membership is already known, a regression equation can be computed that maximally discriminates between two or more groups (George & Mallery, 2003).

In terms of reliability, the Cronbach alpha coefficient value of all variables were above 0.7, indicating an acceptable and good internal consistency reliability of validated measurement scales (Sekaran & Bougie, 2014). In terms of validity, the KMO measure of sampling adequacy was 0.662, indicating sufficient inter-correlations and the Bartlett's test of Sphericity was significant (Chi-square=247.41, $p<0.01$). Eigenvalues greater than 1.0 and the total variance explained was 39.14 percent of the total variance. All items loaded into the five components as expected. Among the components, myopia was associated with 20.12 percent of the variance in the original data, followed by credit card repayment (20.11%), risk aversion (20.04%), overspending (19.86%) and impulsiveness (19.8%). All independent variables were significantly positive correlated with credit card repayment, as in shown in Table 1.

Table 1

Inter-Correlations of Major Variables

	1	2	3	4	5
Overspending	-				
Risk Aaversion	0.165**	-			
Myopia	0.248**	0.075*	-		
Impulsiveness	0.451**	0.142**	0.382**	-	
Credit Card Rrepayment	0.319**	0.078*	0.080*	0.192**	-

Note. ***p<0.01, **p<0.05, *p<0.1

RESULTS

Descriptive Analysis

As shown in Table 2, the sample comprises 220 males (48.78%) and 231 females (51.22%). A higher percentage of the respondents were aged below 36 (55.43%). The remaining 41.69 percent of them were aged between 36 to 55, while 2.88% were aged 55 and above.

A smaller percentage of the respondents only had secondary level education (14.2%). Respondents with a diploma or degree totalled 262 people (58.22%) and those with masters and above numbered 124 respondents (27.56%). Almost half of the respondents earned a lower income (RM2,000 to RM4,000). Those earning middle income were 127 respondents (28.22%) and those earning higher income were 109 respondents (24.22%). The majority of the respondents were Bumiputra (81.34%) and married (68.07%).

Table 2

Demographic Profile of Respondents

Variable	Number of observations	(%)
Gender		
Male	220	48.78
Female	231	51.22
Age		
Age up to 35	250	55.43
36 to 55	188	41.69
55 and above	13	2.88
Education		
Secondary	64	14.22
Diploma and Degree	262	58.22
Masters and above	124	27.56
Income		
RM2,000 to RM4,000	214	47.56
RM4,001 to RM6,000	127	28.22
RM6,000 and above	109	24.22
Ethnicity		
Bumiputra	345	81.34
Chinese	42	9.33
Indian and others	29	6.44
Marital Status		
Single	127	28.16
Married	307	68.07
Divorced / Widowed	17	3.77

Differences in Credit Card Repayments based on the Demographic Profile

The T-test results in the last row of Table 3 show that there is no significant mean difference in credit card repayment between males and females (p = 0.443). Similar results were obtained by Aydin (2022) in the case of credit cardholders in Turkey and Jusoh et al. (2012) in the case of Malaysia. The results in Table 3 also show, as determined by a one-way ANOVA (F (2,448) = 0.75, p = 0.473), that there is no statistically significant difference in credit card repayments between groups with different age categories. This is in contrast to the findings in Wang et al. (2011) and Hamid and Loke (2021a). Meanwhile, the one-way ANOVA analysis done to identify if people with a different academic qualification differ in their credit card repayments showed that there was a statistically significant difference between groups in their credit card repayment (F(2,447) = 6.69, p = 0.001). A Scheffe post-hoc test revealed that those with secondary education, and Masters and above qualifications differed significantly in their credit card repayment (-0.320 ± -0.57, p = 0.008). Also, there was a significant difference in the credit card repayment between those with a diploma and degree qualifications, and Masters and above qualifications (-0.23 ± -0.41, p = 0.007). However, no statistically significant difference was observed in the credit card repayment between those with secondary education, and diploma and degree qualifications. Barboza (2018); Hamid and Loke (2021) and Salisbury and Zhao (2020) also find that individuals with a higher educational attainment made better credit card repayment decisions.

Additionally, results in Table 3 also show that there was a statistically significant difference between income groups in their credit card repayment (F (2,447) = 3.16, p = 0.043). A Scheffe post-hoc test revealed that those earning income between RM2,000 to RM4,000, and above RM6,000 differed significantly in terms of their credit card repayment (-0.20 ± -0.39, p = 0.044). However, no statistically significant differences were observed between other groups. Salisbury (2014) also finds that credit card repayments vary based on income. Results in Table 2 show that credit card repayments differed between races (F (2,447) = 4.2, p = 0.016). A Scheffe post-hoc test revealed that there was a statistically significant difference in the credit card repayment behavior between Bumiputra and Chinese respondents

(-0.30 ± -0.57, p = 0.024). However, no statistically significant differences were observed between other groups. Stavins (2020) also finds a significant difference in credit card debt based on the race of the cardholders. The findings also show that credit card repayment varied based on the participants marital status (F (2,448) = 2.90, p =0.056). A Scheffe post-hoc test revealed that there was a statistically significant difference in the credit card repayment between single and married individuals (0.17 ± -0.01, p = 0.058). A similar observation was obtained by Hamid and Loke (2021b).

Table 3

T-Test and Anova Test for the Differences in Demographic Profile and Credit Card Repayment

Variables	Mean	F-value	p-value
Gender			
Female	1.66	-0.8	0.422
Male	1.71		
Age			
Less than 35	1.69		
36-55	1.7	0.75	0.473
55 and above	1.46		
Academic Qualification			
Secondary	1.83		
Diploma and degree	1.74	6.69	0.001***
Master and above	1.51		
Income			
RM2,000- RM4,000	1.76		
RM4,001- RM6,000	1.68	3.16	0.043**
Above RM6,000	1.56		
Race			
Bumiputra	1.73		
Chinese	1.43	4.2	0.016**
Indian and others	1.6		
Marital Status			
Single	1.57		
Married	1.74	2.9	0.056*
Widowed / Divorced	1.65		

Note. ***p<0.01, **p<0.05, *p<0.1

The above findings haved confirmed that credit card repayments vary based on the demographic profile of the cardholders, thus providing support for Hypothesis 1 of this study.

Relationship between Credit Card Holders' Behavioral Biases and Credit Card Payment

A discriminant analysis can be leveraged to determine which independent variables are related to the dependent variable, as well as to predict the value of the dependent variable based on the values of the independent variables. By performing a discriminant analysis, the present study can address classification problems in which two or more groups, clusters, or populations are known up front, and one or more new observations are placed into one of the known classifications based on measured characteristics. In this study, a discriminant analysis was used to determine the relationship between behavioral biases and credit card payment. The analysis sought to answer the question of whether a combination of overspending, risk aversion, myopia, and impulsiveness could predict whether an individual would make full payment of the outstanding balance, or pay more than the minimum amount, or pay the minimum amount or less. Several assumptions must be met for the discriminant analysis to produce a valid result.

The multivariate test has a goodness of fit statistics measured by Wilks' Lambda as shown in Table 4, whereby p-values were less than 0.05 ($p < 0.05$), meaning that the model was a good fit for the data. A small lambda (< 1.00) indicates that the group means appeared to differ. The associate significance values indicate whether the difference was significant. For those who made full payment of the outstanding balance, the mean for overspending was 1.74, risk aversion was 2.73, myopia was 1.74 and impulsiveness was 1.75. For those who were paying more than the minimum amount, the mean for overspending was 2.55, risk aversion was 2.94, myopia was 1.94 and impulsiveness was 2.20. For those who were paying the minimum or less, the mean for overspending was 2.57, risk aversion was 2.82, myopia was 2.12 and impulsiveness was 2.35. Behavioral factors related to overspending, myopia and impulsiveness have shown significant initial differences in predicting whether an individual will make full payment of the outstanding balance, or paying more than the minimum amount, or paying the minimum amount or less.

A significant relationship between overspending and credit card debt was also observed by Barboza et al. (2017) and Wong and Lynn (2020). The findings of this study are also in line with those

in Gathergood (2012) and Ottaviani and Vandone (2018) which had observed a significant relationship between impulsiveness and debt holdings. Additionally, the significant link observed between myopia and credit card debt repayment is similar to the findings of Kuchler and Pagel (2018).

Table 4

Group Means, Wilks' Lambda (U-statistic) and Univariate F-ratio

Variable	Group 1 mean	Group 2 mean	Group 3 mean	Total mean	Wilks' Lambda	F	Signif.
Overspending	1.74	2.55	2.57	2.2	0.849	39.09	0.000***
Risk aversion	2.73	2.94	2.82	2.84	0.993	1.492	0.226
Myopia	1.74	1.94	2.12	1.87	0.986	3.029	0.049**
Impulsive	1.75	2.2	2.35	2.02	0.948	12.049	0.000***

Note. Group 1 refers to those who are making full payment of the outstanding balance, Group 2 refers to those who are paying more than the minimum amount, and Group 3 refers those who are paying the minimum or less; ***$p<0.01$, **$p<0.05$, *$p<0.1$

Log Determinants and Box's M Tables

Box's M tests the null hypothesis that the covariance matrices do not differ between groups formed by the dependent. Box's M tests the equality of group covariance matrices, and measures the multivariate normality of the data, whereby approximate F is a transformation that tests whether the determinants from each level of the dependent variable differ significantly from each other. It is desirable that this test not be significant so that the null hypothesis that the groups do not differ can be retained. For this assumption to hold, the log determinants should be equal.

Table 5

Log Determinants Table

Log Determinants		
Group	Rank	Log Determinant
Full payment of the outstanding balance	5	0.091
Paying more than the minimum amount	5	-0.242
Paying the minimum amount or less	5	0.439

Note. The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Table 6

Box's M Test Result Table

Test Results		
Box's M		35.629
F	Approx.	1.158
	df1	42
	df2	75247.506
	Sig.	0.253

Note. Tests null hypothesis of equal population covariance matrices.

In Box's M test, a non-significant M is required to show similarity and a lack of significant differences. In this case, the log determinants appeared similar and Box's M was 35.629, with F = 1.158. The p-value of 0.253 indicates that the data did not differ significantly from the multivariate normal.

Eigenvalues

Eigenvalues provide information on each of the discriminate functions (equations) produced. The maximum number of discriminant functions produced is the number of groups minus 1. A large Eigenvalue is associated with a strong function (1.5 to 2.5 is acceptable). In this study, it was found that the Eigenvalue for Function 1 was 0.200, which was stronger than Function 2 (0.005).

Canonical Correlation

The canonical correlation is the multiple correlation between the predictors and the discriminant function. There were three groups tested in the study, namely 'full payment of the outstanding balance', 'paying more than the minimum amount' and 'paying the minimum amount or less'. There are two functions displayed in a canonical correlation. The correlation indicates that Function 1 moderately discriminates between groups, while Function 2 weakly discriminates between groups (1.00 is perfect). In this study, a canonical correlation of .408 suggested that the model in Function 1 explained 16.65 percent of the variation in the grouping variable, i.e. whether a respondent made a full payment of the outstanding balance or was paying more than the minimum amount. For Function 2, a canonical correlation of

0.069 suggested that the model explained 0.48 percent of the variation in the grouping variable, i.e. whether a respondent was paying more than the minimum amount or paying the minimum amount or less.

Wilks' Lambda

Wilks' lambda indicates the significance of the discriminant function. In this study, Wilks' lambda indicated a highly significant function ($p < 0.000$) and provided the proportion of total variability not explained, i.e. it was the converse of the squared canonical correlation. For Function 1, 83.35 percent of the variation were unexplained while for Function 2, 99.5 percent of the variation in the grouping variable were unexplained. A small lambda in Function 1 indicated that the three group means appeared to differ between those who made full payment of the outstanding balance, paid more than the minimum amount, and paid the minimum amount or less. A high Chi-Square value indicated that Function 1 discriminated well ($p \leq 0.001$) while Function 2 did not ($p = 0.719$).

Table 7

Eigenvalues, Canonical Correlation, and Wilks' Lambda Table

Test of Function	Eigen Value	% of variance	Cum %	Canonical correlation	Test of function	Wilks' Lambda	X^2	df	Sig.
1	0.200	97.7	97.7	0.408	1 through 2	0.829	82.049	10	0.000
2	0.005	2.3	100.0	0.069	2	0.995	2.089	4	0.719

The Canonical Discriminant Function Coefficient

Unstandardized coefficients (b) were used to create the discriminant function (equation). They operated just like a regression equation. The discriminant function coefficients (b) or standardized form beta both indicate the partial contribution of each variable to the discriminate function, controlling for all other variables in the equation. They can be used to assess each IV's unique contribution to the discriminate function and thus, provide information on the relative importance of each variable. If there are any dummy variables, as in regression, individual beta weights cannot be used and dummy variables must be assessed as a group through hierarchical discriminant analysis; running the analysis, first without the dummy variables then with

them. The difference in squared canonical correlation indicates the explanatory effect of the set of dummy variables.

Table 8

Unstandardised Canonical Discriminant Function Coefficients

	Function	
	1	2
Overspending	0.79	-0.572
Risk aversion	0.011	-0.432
Myopia	-0.011	0.467
Impulsive	0.127	0.506
(Constant)	-2.895	-0.22

Based on the list of coefficients (and the constant) of the discriminant equation in Table 8, the discriminant function/equations are as follows:

Function 1
D1 = -2.895 + 0.79(overspending) + 0.011(risk aversion) – 0.011(myopia) +0.127 (impulsiveness)

Function 2
D2 = -0.220 – 0.572(overspending) -0.432(risk aversion) + 0.467(myopia) + 0.505 (impulsiveness).

For Function 1, the overspending score was the strongest predictor in importance as a predictor. This variable with a large coefficient stood out as the one that strongly predicted allocation between making full payment of the outstanding balance or paying more than the minimum amount group. Impulsiveness, risk aversion, and myopia scores were less successful as predictors. For Function 2, all the variables seemed not to be different from each other and may be less able to be predictors which allocate between paying more than the minimum amount or paying the minimum amount or less group.

Classification Table

Finally, there is the classification stage. The classification table, is a table in which the rows are the observed categories of the dependent

and the columns are the predicted categories. When prediction is perfect, all cases will lie on the diagonal. The percentage of cases on the diagonal is the percentage of correct classifications. The cross validated set of data is a more authentic presentation of the power of the discriminant function than that provided by the original classifications, and often produces a poorer outcome. The cross-validation is normally termed a 'jack-knife' classification. It develops a discriminant function by successively classifying all cases according to categories. This is repeated until no case is left out in the process.

Table 9

Classification Table

Actual Group	Predicted Group Membership			Total
	full payment of the outstanding balance	paying more than the minimum amount	paying the minimum amount or less	
Full payment of the outstanding balance	133 (68.6%)	61 (31.4%)	0 (0%)	194 (100%)
Paying more than the minimum amount	57 (28.8%)	141 (71.2%)	0 (0%)	198 (100%)
Paying the minimum amount or less	17 (33.3%)	34 (66.7%)	0 (0%)	51 (100%)
Total	207	236	0	443 (100%)
Priors	0.438	0.447	0.115	1.00

Note. 61.9% of original grouped cases correctly classified.

Classification gives information about actual group membership vs. predicted group membership. From Table 6 it can be seen that 61.9 percent of original grouped cases were correctly classified by all the independent variables (overspending, risk aversion, myopia and impulsiveness). The combination of these variables was better at predicting those who were paying more than the minimum amount (71.2%) than those who made full payment of the outstanding balance (68.6%) and those who were paying the minimum amount or less. This seemed to suggest that other factors could be influencing the payment decision of the last group. Ferreira et al. (2021) found that over-indebtedness was caused by the lack of financial literacy and

social-economics factors. Meanwhile, Leandro and Botelho (2022) found that overindebtedness could be caused by materialism, while (French & McKillop, 2016) found that it could be caused by the lack of money management skills. The findings of this study have reaffirmed the relationship between behavioral biases and credit card repayments, providing support for Hypothesis 2.

CONCLUSION

Rising consumer debt has become a major concern in Malaysia. Bankruptcies related to credit card loan has increased over the years especially among the younger generations. The existing literature in consumer finance highlights the role of behavioral biases in influencing over indebtedness. This study contributes to the literature by analyzing the link between behavioral biases and credit card repayment among Malaysians. It has been able to provide support for the proposal that credit card repayments vary according to users' demographic profile. Additionally, the study has shown that behavioral biases can be used to predict credit card repayments.

As far as credit card repayment decision is concerned, the study found that it differed according to the academic qualification, income, race and marital status of the respondents. The findings showed that those with a higher academic qualification and income made better repayments decisions. Additionally, it was revealed that Chinese respondents made significantly better repayments than the Malays. Similarly, married respondents make better repayments than the singles. Moreover, the discriminant analysis showed that 61.9 percent of original grouped cases were correctly classified by the behavioral factors related to overspending, risk aversion, myopia and impulsiveness. However, the findings seemed to suggest that these variables were better at predicting those who were paying more than the minimum amount and those who made full payment of the outstanding balance, but not those who only paid the minimum amount or less. As far as the predictor variables were concerned, it was found that overspending remained as the strongest predictor which discriminated between these groups, followed by risk aversion, myopia and impulsiveness.

This study has contributed to the body of knowledge on consumer finance by analysing the link between behavioral biases and credit

card repayment among Malaysians. For examplw, it was shown that behavioral biases have deterred consumers from making an optimal decision. Hence, it is very crucial to identify how these biases influence credit card repayments, so as to be able to ensure that appropriate measures can be taken to alleviate them. The existing literature has highlighted that individuals who were less vulnerable to behavioral biases made better financial decisions. Consistent with this general consensus, the present study has provided further evidence that credit card holders who earned higher income and had better academic qualifications usually demonstrated better repayment decisions. It is thus, clear that measures taken by the regulators to improve credit card repayments need to focus more on certain group of individuals who are more vulnerable than others. Additionally, regulators also need to take measures to educate consumers about behavioral biases related to overspending, impulsiveness, myopia and risk taking. This can be done through awareness campaigns in the regular and social media.

Overall, the present study has concluded that the behavioral biases studied were able to better predict those who would make better repayment decisions, but has failed to identify those who didn't. Based on its findings, the practical implication that can be derived is that loan providers can benefit from the perceptual map, by mapping loan applicants based on their behavioural biases and consumer traits. One is in a better position to predict whether the loan applicant will make better repayment decisions. This will certainly assist the relevant personnel in charge of loans make better decisions pertaining to loan approval.

However, this study has several limitations. Firstly, the sample used did not represent the general population in Malaysia as it was only focused on the northern region of west Malaysia. Secondly, the failure of behavioral biases in predicting those who only made the minimum or lower payment seems to suggest that a more comprehensive model that incorporates other factors that influence financial decision making need to be considered in future research. Future studies should explore the role of other types of behavioral biases,for example, attitudes and personality traits. Lastly, future studies also can look into different types of behavioral biases related to credit card repayment, such as mental accounting, availability bias, limited attention and overconfidence bias.

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REFERENCES

Ahmad, Z., Ibrahim, H., & Tuyon, J. (2018). Governance of behavioural biases in asset management industry: Insights from fund managers in Malaysia. *Asian Academy of Management Journal of Accounting and Finance*, *14*(2), 65–102. https://doi.org/10.21315/aamjaf2018.14.2.4.

Aydin, A. E. (2022). Psychological and demographic factors influencing responsible credit card debt payment. *Journal of Financial Services Marketing*. Palgrave Macmillan UK. *27*(1), 17–26. https://doi.org/10.1057/s41264-021-00094-0.

Barberis, N., & Thaler, R. (2003). A survey of behavioral finance. *Handbook of the Economics of Finance*, *1*, 1053–1128. http://www.nber.org/papers/w9222.

Barboza, G. (2018). I will pay tomorrow, or maybe the day after. Credit card repayment, present biased and procrastination. *Economic Notes*, *47*(2–3), 455–494. https://doi.org/10.1111/ecno.12106.

Barboza, G. A., Smith, C., & Boubacar, I. (2017). A contribution to the empirics of consumers' anxiety behavior on and in credit card repayment. Credit card management and financial literacy among college student. *Journal of Financial Management, Markets and Institutions*, (1), 35–66. https://doi.org/10.12831/87059.

Barlow, H. D. (1991). Explaining crimes and analogous acts, or the unrestrained will grab at pleasure whenever they can. *The Journal of Criminal Law and Criminology*, *82*(1), 229-297. https://scholarlycommons.law.northwestern.edu/jclc/vol82/iss1/11

Baumeister, R. F. (2002). Yielding to temptation: Self-control failure, impulsive purchasing, and consumer behavior. *The Journal of Consumer Research*, *28*(4), 670–676.

Brahmana, R., Hooy, C. W., & Ahmad, Z. (2015). Monday irrationality of investors in bursa Malaysia: The role of psychological biases. *Malaysian Journal of Economic Studies*, *52*(2), 227–243.

Brown, M., & Graf, R. (2013). *Financial literacy, household investment and household debt: Evidence from Switzerland*. Working Papers on Finance. 13/1. http://www1.vwa.unisg.ch/RePEc/usg/sfwpfi/WPF-1301.pdf.

Ceschi, A., Costantini, A., Sartori, R., Weller, J., & Di Fabio, A. (2019). Dimensions of decision-making: An evidence-based classification of heuristics and biases. *Personality and Individual Differences*, 146(November 2017), 188–200. https://doi.org/10.1016/j.paid.2018.07.033.

Chin, K. Y., Yi, W. C., Kwan, C. L., & Si, C. M. (2017). An empirical investigation on credit card repayment pattern of academicians in Malaysia. *The International Journal of Banking and Finance*, *13*(2), 21–42. https://doi.org/10.4018/978-1-4666-6268-1.ch065.

Chong, F. N. (2017). Factors affecting credit card debt payment in Malaysia. *International Journal of Business and Economics*, *16*(1), pp. 21–30.

Chybalski, F., & Marcinkiewicz, E. (2018). Myopic behaviour and state involvement in a pension system: A cross-section study for OECD countries. *Ekonomista*, *1*, 68–88.

Combrink, S., & Lew, C. (2020). Potential underdog bias, overconfidence and risk propensity in investor decision-making behavior. *Journal of Behavioral Finance*. *21*(4), 337–351. https://doi.org/10.1080/15427560.2019.1692843.

Ferreira, M. B., Pinto, D. C., Herter, M. M., Soro, J., Vanneschi, L., Castelli, M., & Peres, F. (2021). Using artificial intelligence to overcome over-indebtedness and fight poverty. *Journal of Business Research*, *131*, 411–425.

French, D., & McKillop, D. (2016). Financial literacy and over-indebtedness in low-income households. *International Review of Financial Analysis*. Elsevier B.V., *48*, 1–11. https://doi.org/10.1016/j.irfa.2016.08.004.

Gathergood, J. (2012). Self-control, financial literacy and consumer over-indebtedness'. *Journal of Economic Psychology*. Elsevier B.V., *33*(3), 590–602. https://doi.org/10.1016/j.joep.2011.11.006.

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference* (4th ed.). Allyn & Bacon.

Gerardi, K., Goette, L., & Meier, S. (2010). *Financial literacy and subprime mortgage*, *federal reserve bank of Atlanta Working Paper*. No. 2010-10.

Grund, C., & Sliwka, D. (2010). Evidence on performance pay and risk aversion. *Economics Letters*. Elsevier B.V., *106*(1), 8–11. https://doi.org/10.1016/j.econlet.2009.09.005.

Hamid, F. S., Rangel, G. J., Taib, F. M., & Thurasamy, R.. (2013). The relationship between risk propensity, risk perception and risk-taking behaviour in an emerging market. *The International Journal of Banking and Finance*, *10*(1), 134–146.

Hamid, F. S., & Loke, Yiing Jia. (2021a). Financial literacy, money management skill and credit card repayments. *International Journal of Consumer Studies*, *45*(2), 235–247. https://doi.org/10.1111/ijcs.12614.

Hamid, F. S., & Loke, Yiing Jia. (2021b). Information disclosure and credit card repayments: Evidence from Malaysia. *International Journal of Bank Marketing*, *39*(7), 1479–1497. https://doi.org/10.1108/IJBM-03-2021-0082.

Heidhues, P., & Koszegi, B. (2010). Exploiting naivete about self-control in the credit market. *American Economic Review*, *100*(5 December), 2279-2303. https://www.jstor.org/stable/41038763

Huebner, J., Fuchs, K., & Ilic, A. (2018). Preventing over-spending: Increasing salience of credit card payments through smartphone interventions. *MKWI 2018 - Multikonferenz Wirtschaftsinformatik*, 1075–1082.

Jaiyeoba, H. B., Abdullah, M. A., & Ibrahim, K. (2020). Institutional investors vs retail investors: Are psychological biases equally applicable to investor divides in Malaysia? *International Journal of Bank Marketing*, *38*(3), 671–691. https://doi.org/10.1108/IJBM-07-2019-0242.

Jusoh, Z. M., & Lin, L. Y. (2012). Personal financial knowledge and attitude towards credit card practices among working adults in Malaysia. *International Journal of Business and Social Science*, *3*(7), 176–185.

Kuchler, T., & Pagel, M. (2018). *Sticking to your plan: The role of present bias for credit card paydown*. National Bureau of Economic Research. No. w24881.

Leandro, J. C., & Botelho, D. (2022). Consumer over-indebtedness: A review and future research agenda. *Journal of Business Research*, 145(March), 535–551. https://doi.org/10.1016/j.jbusres.2022.03.023.

Limerick, L., & Peltier, J. W. (2014). The effects of self-control failures on risky credit card usage. *Marketing Management Journal*, *24*(2), 149–161.

Lin, W.-R., Wang, Y.-H., Yang, F. -J., & Sekarini, N. S. (2015). The effect of credit card usage on compulsive buying behavior intention. *Journal of Accounting, Finance & Management Strategy*, *8*(2), 45–74. https://doi.org/10.5824/1309-1581.2015.3.002.x.

Lo, H. Y., & Harvey, N. (2011). Shopping without pain: Compulsive buying and the effects of credit card availability in Europe and the Far East. *Journal of Economic Psychology*. *32*(1), 79–92. https://doi.org/10.1016/j.joep.2010.12.002.

Loke, Y. J., Yen, S. T., & Tan, A. K. G. (2011). *Credit card averters and amassers: Evidence from Malaysia. Asian Economic Journal, 25*(4), 397–412. https://doi.org/10.1111/j.1467-8381.2011.02068.x.

Meier, S., & Sprenger, C. (2010). Present-biased preferences and credit card borrowing. *American Economic Journal: Applied Economics, 2*(1), 193–210. https://doi.org/10.1257/app.2.1.193.

Ottaviani, C., & Vandone, D. (2018). Financial literacy, debt burden and impulsivity: A mediation analysis. *Economic Notes, 47(2–3),* 439–454. https://doi.org/10.1111/ecno.12115.

Pak, O., & Mahmood, M. (2015). Impact of personality on risk tolerance and investment decisions: A study on potential investors of Kazakhstan. *International Journal of Commerce and Management, 25*(4), 370–384. https://doi.org/10.1108/IJCoMA-01-2013-0002.

Palan, K. M., Morrow, P. C., Trapp, A., & Blacburn, V. (2011). Compulsive buying behavior in college students: The mediating role of credit card misuse. *Journal of Marketing Theory and Practice, 19*(1), 81–96. https://doi.org/10.2753/MTP1069-6679190105.

Peltier, J. W., Pomirleanu, N., Endres, M., & Markos, E. (2013). Psycho-social factors impacting credit acquisition and use by college students. *Journal of Financial Services Marketing, 18*(4), 271–284. https://doi.org/10.1057/fsm.2013.20.

Pirog, S. F., & Roberts, J. A. (2007). Personality and credit card misuse among college students: The mediating role of impulsiveness. *Journal of Marketing Theory and Practice, 15*(1), 65–77. https://doi.org/10.2753/MTP1069-6679150105.

Ramayah, T., Noor, N., & Lim, H. C. (2002). Cardholders' attitude and bank credit card usage in Malaysia: An exploratory study. *Asian Academy or Management Journal, 7*(1), 75–102.

Salisbury, L. C. (2014). Minimum payment warnings and information decisions. *Journal of Public Policy & Marketing, 33*(1), 49–64.

Salisbury, L. C., & Zhao, M. (2020). Active choice format and minimum payment warnings in credit card repayment decisions. *Journal of Public Policy and Marketing, 39*(3), 284–304. https://doi.org/10.1177/0743915619868691.

Sekaran, U., & Bougie, R. (2014). *Research methods for business: A skill-building approach* (6 th ed.). John Wiley & Sons.

Sharma, A., & Kumar, A. (2019). A review paper on behavioral finance: Study of emerging trends. *Qualitative Research in Financial Markets*. https://doi.org/10.1108/QRFM-06-2017-0050.

Shefrin, H. M., & Thaler, R. (1981). An economic theory of self-control. *Journal of Political Economy*, *89*(2), 392–406.

Soman, D. (2001). Effects of payment mechanism on spending behavior: The role of rehearsal and immediacy of payments. *Journal of Consumer Research*, *27*(4), 460–474. https://doi.org/10.1086/319621.

Sotiropoulos, V., & D'Astous, A. (2012). Social networks and credit card overspending among young adult consumers. *Journal of Consumer Affairs*, *46*(3), 457–484. https://doi.org/10.1111/j.1745-6606.2012.01239.x.

Stavins, J. (2020). Credit card debt and consumer payment choice: What can we learn from credit bureau data? *Journal of Financial Services Research*, *58*(1), 59–90. https://doi.org/10.1007/s10693-019-00330-8.

Sunstein, C. R. (2006). Boundedly rational borrowing. *University of Chicago Law Review*, *73*(1), 249–270.

Teoh, W. M., Chong, S., & Yong, S. M. (2013). Exploring the factors influencing credit card spending behavior among Malaysians. *International Journal of Bank Marketing*, *31*(6), 481–500. https://doi.org/10.1108/IJBM-04-2013-0037.

The Malaysian Reserve. (2019). *Credit cards, personal loans landing Malaysians in debt trap*. 8 August. https://themalaysianreserve.com/2019/08/08/credit-cards-personal-loans-landing-malaysians-in-debt-trap/

Theong, M. J., Osman, A. F., & Yap, S. F. (2018). Household indebtedness: How global and domestic macro-economic factors influence credit card debt default in Malaysia. *Institutions and Economies*, *10*(3), 37–56.

Wang, L. L., Lu, W., & Malhotra, N. K. (2011). Demographics, attitude, personality and credit card features correlate with credit card debt: A view from China. *Journal of Economic Psychology*. *32*(1), 179–193. https://doi.org/10.1016/j.joep.2010.11.006.

Wang, L., Lv, W., & Jiang, L. (2011). The impact of attitude variables on the credit debt behavior. *Nankai Business Review International*, *2*(2), 120–139. https://doi.org/10.1108/20408741111139909.

Wei, C.-Y., Chin, L. -K., Kuah, Y. -C., & Chia, M. -S. (2018). Attributes of academicians' credit card usage behaviors in Malaysia. *Journal of Contemporary Issues and Thought*, *8*, 73–85. https://doi.org/10.37134/jcit.vol8.8.2018.

Wong, K. Y., & Lynn, M. (2020). Credit card cue effect: How mere exposure to credit card cues promotes consumers' perceived financial well-being and spending. *International Journal of Bank Marketing*, *38*(2), 368–383. https://doi.org/10.1108/IJBM-01-2019-0010.

World Bank. (2019). *Malaysian economic monitor: Making ends meet*. https://doi.org/10.1787/g2355e556-en.