



Financial literacy and the intention-behaviour discrepancy of repayment: Moderate-mediating effect of hyperbolic discounting

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ABSTRACT

Hyperbolic discounting or present bias is a behaviour in which borrowers tend to repay their debt over time inconsistently, commonly found in student loan borrowers. We analysed this student loan repayment by contending the theory of reasoned action, financial literacy, and hyperbolic discounting. First, we addressed hyperbolic discounting as the explanation for the intention-behaviour discrepancy of student loan repayment. The discrepancy here means the gap between intention and actual behaviour. Then, we examined the effect of financial literacy on that relationship. Using the PLS-SEM method, we estimated our model on 391 graduate students. The findings are interesting: (i) financial literacy directly increases the intention to repay the student loan, but not the actual behaviour. It needs the mediation of intention to increase the actual behaviour; (ii) hyperbolic discounting weakens the intention-behaviour discrepancy of loan repayment, and (iii) hyperbolic discounting can lead to poor decision-making even with strong good intention at the initial stage. However, the hyperbolic discounting effect is diminished for the financial literacy path. With a better understanding of the borrowers' behaviour and financial literacy towards student loan repayments, policymakers can develop strategies and design repayment criteria to help borrowers commit more to repayments.

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1. INTRODUCTION

Student loans are one of the most prevalent forms of consumer debt worldwide. It has been a significant concern for policymakers, not only because of its growing size but also because of the difficulty of paying it off. Given these trends, it is apparent that student loans can impact the student ecosystem. Therefore, it is crucial to explore the delinquency of student loan repayment.

From a behavioural perspective, the intention to repay a student loan is not always translated into actual repayment behaviour due to time-inconsistent decision-making (Ajzen & Kruglanski, 2019; Sheeran & Webb, 2016; Wong & Sheth, 1985), a phenomenon commonly referred to as the intention–behaviour discrepancy. This discrepancy may be particularly pronounced in student loan repayment because borrowers experience a substantial time lag between receiving educational financing and fulfilling their repayment obligations. Behavioural finance literature attributes this inconsistency to hyperbolic discounting, whereby individuals place greater value on immediate benefits relative to future obligations (Huffman & Barenstein, 2005; Kirby & Herrnstein, 1995). Hyperbolic discounting reflects present-biased preferences and explains why borrowers may postpone repayment despite initially intending to honour their financial commitments (Ikeda & Kang, 2015; Huffman & Barenstein, 2005; Ainslie, 1992). Consequently, student loan delinquency may arise not only from financial constraints but also from self-control problems and dynamically inconsistent preferences, where immediate consumption is prioritised over future repayment commitments. Therefore, we propose that student loan repayment delinquency might relate to graduated students' self-control problems.

Intriguingly, personal finance literature suggests that financial literacy may play an important role in explaining this intention–behaviour discrepancy. Prior studies consistently demonstrate that financial literacy is positively associated with sound financial management and decision-making (Lusardi & Mitchell, 2017; Lusardi et al., 2017; Lusardi et al., 2010). Nevertheless, many student loan borrowers enter borrowing arrangements without fully understanding the long-term financial implications of educational debt, resulting in repayment difficulties, delayed payments, and financial anxiety. Therefore, while hyperbolic discounting may explain why borrowers fail to act on their repayment intentions, financial literacy may serve as a critical mechanism that mitigates this behavioural tendency and promotes more responsible repayment behaviour.

Malaysia fits our theoretical deductive reasoning for several reasons. First, despite the Malaysian government's outstanding efforts to help the nation achieve higher education at the tertiary level by providing them with financial assistance, many graduates who are student loan takers tend to take it for granted. For example, student loan repayments were around 60%, implying that 40% of borrowers have bad loans or have not yet paid the loans. Second, Malaysia's financial literacy is lower than global financial literacy (Brahmana & Memarista, 2018), which is in line with our proposition: having low financial literacy may be the reason behind the lousy student loan repayment. Third, the Malaysian graduates' behaviours on delaying their student loan repayments can be addressed by borrowers' attitudes. Prior studies on student loans focus on the factors that cause people to use more credit and what factors cause people to get trapped in financial difficulties until they cannot repay the debt they agreed to borrow (Davies & Lea, 1995). These numerous studies conducted on determinants of student loan repayments performance are more often associated with borrowers' characteristics such as demographic, social and economic conditions, institutional characteristics, college experiences, debt composition, awareness of education debt, and

composition of student loan borrowers (Mueller & Yannelis, 2019; Chen & Wiederspan, 2014; Lusardi et al., 2010; Hira et al., 2000), which is aligned with Malaysia context.

Although previous studies have established the importance of financial literacy in shaping financial decision-making and repayment intentions, evidence regarding its influence on actual repayment behaviour remains inconclusive. Furthermore, existing research has largely examined financial literacy and behavioural biases separately, providing limited insight into how these factors jointly explain the intention-behaviour discrepancy in student loan repayment. Consequently, the mechanisms through which borrowers form repayment intentions but subsequently fail to translate those intentions into actual repayment behaviour remain insufficiently understood. Addressing this gap is important for both theory and policy, as improving repayment outcomes requires understanding not only what borrowers know, but also how behavioural tendencies influence their actions. Therefore, this study integrates financial literacy and hyperbolic discounting within the Theory of Reasoned Action (TRA) framework to provide a more comprehensive explanation of student loan repayment behaviour. To achieve that objective, we use the moderated mediation approach. This is why this research will have several sequences of tests. First, we test the direct and indirect effects of financial literacy on the intention-behaviour discrepancy of student loan repayment. Then, we examine the moderating role of hyperbolic discounting. The third stage is the mediating effect of Intention to repay on the relationship between financial literacy and actual repayment behaviour. Finally, we test the moderated mediation analysis of hyperbolic discounting from the financial literacy path analysis.

In sum, our study extends the study from Almenberg et al. (2018) by elaborating on financial literacy and hyperbolic discounting. In Almenberg et al. (2018), the model focuses on the theory of consumption and savings. Meanwhile, our model is more focused on attitude and behaviour. Almenberg et al. (2018) do not directly capture the influence of social pressure (parents, family, friends, and society) on debt behaviour. Meanwhile, our model has subjective norms, which are part of the Theory of Reasoned Action. Finally, we elaborate on the intertemporal bias (present bias) related to debt repayment time inconsistency as suggested by Alessie and Lusardi (1997b). We introduce hyperbolic discounting in our model and treat it as one of our main research focuses.

This study thus examines whether financial literacy influences repayment intention and repayment behaviour among student loan borrowers and investigates whether hyperbolic discounting weakens the translation of repayment intention into actual repayment behaviour. By integrating the Theory of Reasoned Action, financial literacy, and hyperbolic discounting within a moderated-mediation framework, this study seeks to provide a more comprehensive explanation of student loan repayment behaviour. Hence, our study's contribution is threefold. First, we add to the literature by extending the understanding of the intention-behaviour discrepancy of student loan repayment from the Theory of Reasoned Action perspective. Second, we document the empirical findings of the hyperbolic discounting role in that discrepancy. We also introduce financial literacy as part of the factor in the intention-behaviour discrepancy of student loan repayment. Finally, we further establish that financial literacy may play a significant role in reducing the negative effect of hyperbolic discounting on that discrepancy.

This paper is structured as follows. The next section reviews the extant literature relevant to the conceptual framework. Then, the research methodology is presented. Section 4 presents and discusses the findings. The research paper ends with a concluding remark related to the study's theoretical and managerial implications.

2. LITERATURE REVIEW

2.1 The performance of Malaysian student loans

According to the report of Malaysia Higher Education Statistics year 2017, the highest number of Malaysian graduates are those who funded their studies with National Higher Education Fund Corporation (NHEFC) educational student loans (45.5%), self-sponsored (32.7%), followed by The Council of Trust for the People (MARA) educational student loans (7.5%), Ministry of Education (MOE) scholarships (5.0%), Public Service Department (PSD) educational student loans (2.6%), State Foundation educational student loans (1.0%) and other sponsorships (5.7%). On average, borrowers from public or private higher education institutions will have to bear student loans of approximately RM26,600 (approx. USD 9,500, PPP) and RM56,120 (approx. USD 20,043, PPP), respectively, for a four-year degree upon graduation (NHEFC, 2018). As of the end of 2018, the repayment amount received was around 60 per cent of the amount scheduled to be repaid (NHEFC, 2018).

While more students received financial aid from educational loan providers, the trend of low repayments and high default rates has been a concerning issue facing the fund providers. As reported by the NHEFC (2019), the fund provider is experiencing a high delinquency rate where 32 per cent of borrowers are repaying inconsistently, and 19 per cent have not been repaid at all, much higher than what the neighbouring countries are experiencing, such as Singapore (1.4 %), Vietnam (1.1%), Japan (4.2%), and Korea (32%) (Armstrong et al., 2019; Doan et al., 2020; Han et al., 2015).

Evidence from Malaysian higher education institutions suggests that student outcomes and post-graduation trajectories vary substantially across educational pathways, underscoring the importance of examining repayment behaviour within a broader educational performance context (Julaihi & Mohamadin, 2025). Such variation reinforces the argument that student loan repayment issues cannot be explained by financial factors alone.

Malaysia government has initiated various ways to encourage more repayments from borrowers by providing discounts and flexibility in their repayments, such as for those who choose to repay their loan in a one-off lump sum giving 20% discount, who repay at least 50% of their outstanding loan in one time (10%), or those who choose to repay through salary deduction or direct debit (10%) (NHEFC, 2017).

2.2 Theoretical Arguments

Our baseline theoretical framework is based on the Theory of Reasoned Action (TRA) of Fishbein and Ajzen (1975). This theory explains the ways to predict and understand an individual's behaviour. In predicting an individual's behaviour, the simplest and presumably the most efficient thing to do is first to determine his or her intention. It proposes that attitude and subjective norms are two essential factors for intention; thus, intention affects actual behaviour. This theory also explains the discrepancy between intention and actual behaviour. Recent empirical work in the Sarawak higher education context further supports the applicability of intention-based behavioural models, where attitudes and social norms significantly predict students' behavioural intentions (Robin et al., 2025).

We adopt this theory to explain why the intention to repay the student loan might differ from the actual behaviour. Previous research pointed out that divergence between intentions and actual behaviour is mainly caused by individual time inconsistency (D'Orlando & Sanfilippo, 2010; O'Donoghue & Rabin, 1999). It

means that an individual forms an intention to perform a behaviour in the future. However, when it reaches the future time, the individual does not carry out the actual behaviour due to present bias. Individuals tend to delay their intention because of instant gratification received at present, rather than later (O'Donoghue & Rabin, 1999). This behaviour is famously known as hyperbolic discounting.

From a hyperbolic discounting perspective, the borrowers tend to over-pursue instant gratification. Individuals are willing to sacrifice future, more immense, or better rewards for the current smaller reward due to the preference for immediate gratification. Borrowers who should repay their student loans have failed to repay their debt due to short-run impatience and craving for immediate gratification (Meier & Sprenger, 2010). Borrowers are prompted to choose the chance of not repaying their debts, accompanied by the chance of paying more costs at the end due to consequences such as legal fees and opportunity costs caused by a poor credit record.

The delay in repayment is due to a lack of financial literacy. Low basic financial concepts can lead to severe consequences for individual financial well-being, such as poor borrowing and repayment behaviour (Lusardi, 2015). This is consistent with Stolper and Walter (2017), who stated that low levels of financial literacy were related to poor financial behaviour, which is likely to have long-term impacts on an individual's well-being. The availability of relevant information on student loans reaching out to the students and their literacy, mainly on financial literacy, also contributes to determining loan repayment rates (de Bassa Schresberg et al., 2014; Lusardi & Tufano, 2015; Hira et al., 2000). Therefore, this research aims to investigate student loan repayment behaviours. We explored intention drivers to repay student loans and adopted hyperbolic discounting as the moderator, with financial literacy as the main factor.

One may argue the use of TRA as a framework instead of its extension, the Theory of Planned Behaviour (TPB), which incorporates Perceived Behavioural Control (PBC) as an additional determinant of behavioural intention and behaviour (Ajzen, 1991). While TPB has been extensively applied in explaining financial and repayment-related behaviours, the present study adopts TRA because the primary objective is to examine the intention-behaviour discrepancy through the behavioural lens of hyperbolic discounting. Consistent with the Theory of Reasoned Action, behavioural intention is expected to predict actual behaviour; however, prior studies suggest that intentions do not always translate into action due to self-control limitations and time-inconsistent preferences (Ajzen & Kruglanski, 2019; Sheeran & Webb, 2016).

Hyperbolic discounting provides a theoretically relevant explanation for this discrepancy because individuals tend to assign disproportionately greater value to immediate rewards relative to future outcomes (Ainslie, 1992; Kirby & Herrnstein, 1995; Huffman & Barenstein, 2005). In the context of student loan repayment, borrowers may genuinely intend to fulfil their repayment obligations but subsequently postpone repayment when faced with competing short-term financial demands. Consequently, the intention-behaviour discrepancy may arise not from a lack of perceived control, but from present-biased decision-making and dynamically inconsistent preferences (Ikeda & Kang, 2015; Huffman & Barenstein, 2005).

Furthermore, incorporating PBC alongside hyperbolic discounting may introduce conceptual overlap because both constructs attempt to explain why behavioural intentions fail to translate into actual behaviour. To avoid obscuring the specific behavioural mechanism under investigation, this study adopts a more parsimonious TRA framework and extends it by incorporating hyperbolic discounting as a moderating behavioural factor. This approach enables a more focused examination of how financial literacy, repayment intention, and hyperbolic discounting jointly influence student loan repayment behaviour.

Notwithstanding that the TPB is an extension of the TRA, this study engages the TRA to explain the relationships of the predicted determinants towards student loan repayment behaviour and incorporates a behavioural model such as hyperbolic discounting. Hyperbolic discounting is a functional form of discounting that generates present bias and time-inconsistent preferences (Laibson, 1997; Prelec & Loewenstein, 1992). According to Gathergood (2012), self-control can be categorised as an intrapersonal decision time-inconsistency problem. When we attempt to examine the moderating role of hyperbolic discounting on the intention-behaviour discrepancy, we chose not to include PBC in our framework, as the control beliefs contribute to PBC. Ahn et al. (2020) have suggested that when trying to understand individuals' beliefs, a limitation is that an individual can allow for either randomness or self-control but not both phenomena at the same time. Therefore, to avoid potential conflict reflected in our results, we have decided to frame our model with the TRA and content it with the hyperbolic discounting approach instead of the TPB.

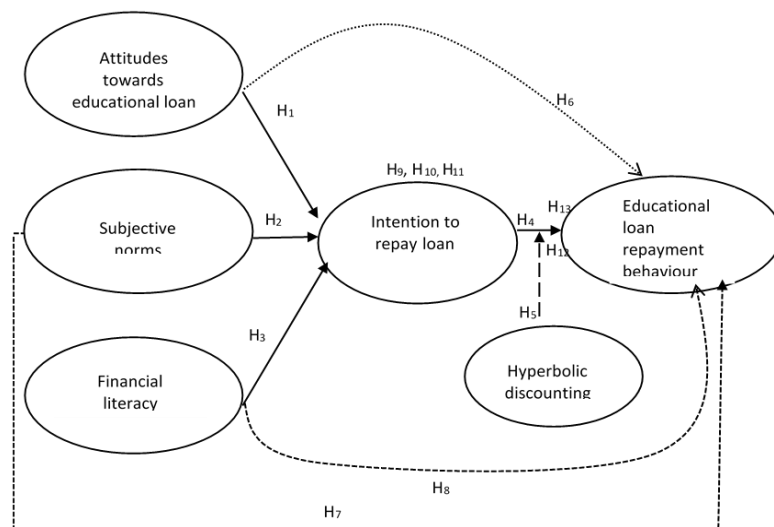


Fig. 1. Research framework with the hypothesis notations.

Overall, our study uses TRA as the baseline framework and integrates it with financial literacy and hyperbolic discounting. We aim to examine those two variables' role in explaining the intention-behaviour discrepancy of student loan repayment. We also adopt the prospect theory to reveal the behavioural argument from the framework. Figure 1 depicts our research framework.

2.3 Hypothesis development

Note that we have 13 hypotheses, which are developed from previous empirical findings. To conserve space, we focus on our main issues: financial literacy and hyperbolic discounting effects on student loan repayment. Meanwhile, the other variables, such as student loan repayment attitude and subjective norms, are well established as key factors in predicting intention and actual behaviour under the Theory of Reasoned Action (TRA) framework. Previous systematic reviews and meta-analyses, such as Ajzen and Kruglanski (2019), Shen and Zideman (2009), Xiao et al. (2009), Becker et al. (1995), and Sheppard et al. (1988), discussed it in detail. We compile all the hypotheses in Table 1.

Table 1. List of hypothesis statements

Notation	Hypotheses
H ₁	Attitude towards student loan repayment has a positive influence on the intention to repay the student loan.
H ₂	Subjective norm has a positive relationship with the intention to repay the student loan.
H ₃	Higher financial literacy increases the intention to repay the student loan.
H ₄	Intention to repay student loans positively affects student loan repayment behaviour.
H ₅	Hyperbolic discounting has a negative effect on student loan repayment behaviour.
H ₆	An increase in attitude towards student loan repayment leads to an increase in student loan repayment behaviour.
H ₇	An increase in subjective norms leads to an increase in student loan repayment behaviour.
H ₈	An increase in financial literacy leads to an increase in student loan repayment behaviour.
H ₉	The intention to repay a student loan mediates the intention to repay the student loan in the relationship between attitude towards student loan repayment and student loan repayment behaviour.
H ₁₀	The intention to repay a student loan mediates the intention to repay the student loan in the relationship between subjective norm and student loan repayment behaviour.
H ₁₁	The intention to repay student loans mediates the relationship between financial literacy and student loan repayment behaviour.
H ₁₂	Hyperbolic discounting would strengthen the positive relationship between the intention to repay student loans and student loan repayment behaviour.
H ₁₃	Hyperbolic discounting has moderated the mediating effect of intention to repay student loans between reasoned action factors and student loan repayment behaviour.

Financial literacy and reasoned action of student loan repayment.

Despite the importance of financial literacy towards individuals' finances, financial literacy levels are relatively low in many other countries, including well-developed nations (Mitchell & Lusardi, 2015). This is intriguing, considering that many previous empirical findings have concluded that financial literacy plays an important role in individuals' ability to manage their financial matters. Previous research has shown how financial literacy affects stock market participation (Van Rooij et al., 2011), savings planning (Lusardi & Mitchell, 2014), corporate governance (Choi et al., 2014), retirement readiness (Lusardi & Mitchell, 2017), and financial resilience (Klapper & Lusardi, 2020).

In personal debt literature, recent findings from Lusardi et al. (2010) discussed debt management and older individuals' capacity to shield against financial insecurity. They found that older individuals are vulnerable to forecasted interest rates, which will make them face the debt payment issue. Gathergood (2012) found that financial literacy negatively affects consumer credit repayment. It shows that low financial literacy will result in excessive financial debt burdens. Lusardi and Tufano (2009) examined the financial debt literacy of an individual on their indebtedness. They found that less knowledge about debt is associated with their inability to judge their debt position.

From student loan literature, Hira et al. (2000) have pointed out that students who borrowed student loans were unaware of their loan indebtedness and payment obligations, which led to the scenario where some students overestimated debt repayments while some underestimated it. Students borrowed in the hope of having a "better lifestyle" by having higher education, yet were unable to predict their future incomes and their capability to repay the student loan. In short, we posit that financial literacy is an essential factor for the intention to repay and actual behaviour to repay the student loan.

Hyperbolic discounting and reasoned action

In this study, the intention to repay the student loan is treated as an indication of a borrower's preparedness to perform actual student loan behaviour (Ajzen & Kruglanski, 2019; Ajzen & Madden, 1986). Nevertheless, Ajzen (1985) warned that this theory is subject to bounded rationality towards time-inconsistency. These boundary conditions may lead to an intention-behaviour discrepancy or be termed as a literal inconsistency (Ajzen & Kruglanski, 2019; Sheeran & Webb, 2016; Wong & Sheth, 1985). We proposed hyperbolic discounting to fill the gap in the body of knowledge for that discrepancy.

Prior research in personal finance has surmised that if borrowers are present-biased with time-inconsistency preferences, they would be tempted to default on the repayment (de Bassa Scheresberg et al., 2014; Prelec & Loewenstein, 1998). It is similar to Strotz's (1955) portraits of the "present self" and the "future self" of a person with hyperbolic discounting. Borrowers' "present self" intends to repay student loans when they signed the contract, but the "future self" might prefer not to work out the plan.

Strotz (1955) hypothesised that a human being is naturally prone to overvalue current consumption from a behavioural perspective. People have a higher discount rate while discounting between the present and near future than in the more distant future. It is consistent with Alessie and Lusardi's (1997a) argument, where current consumption and savings depend on our perception of our past consumption and savings. The saliency of the action's costs and benefits can cause changes in time preferences. In the student loan framework, students mostly receive their student loans in the first year of college or university and agree to future repayment.

Nevertheless, as the completion of studies draws closer, the saliency of the costs and benefits changes. The borrowers are increasingly aware of borrowing costs, while the benefits become less clear (Ariely & Wertenbroch, 2002). The borrowers will suffer the pain of paying during the settlement of loan repayments because debt is unpleasant, and choose to procrastinate (de Bassa Scheresberg et al., 2014; Prelec & Loewenstein, 1998). In the end, a student with present-biased preferences is likely to follow a strategic procrastination repayment behaviour, which is not ideal for accomplishing full repayment of their loans (Barboza, 2018).

In the student loan context, Lochner et al. (2016) revealed the importance of insurance and incentives to tackle the uncertain repayment of student loans. Boatman et al. (2014) addressed hyperbolic discounting as an issue in federal student loan programmes and suggested a behaviour-related policy to tackle it. Cadena and Keys (2013) also addressed hyperbolic discounting as the main factor for students' self-control. Impulse control predicts that students may optimally reject subsidised loans to avoid excessive consumption during school. It is in line with Yoon et al. (2008), who found that many students overweigh the costs of college relative to their long-term financial returns due to hyperbolic discounting.

Therefore, we posit that hyperbolic discounting plays an important role in the intention-behaviour discrepancy of student loan repayment. Borrowers exhibiting stronger present-biased preferences may prioritise immediate consumption over future repayment obligations, thereby reducing their likelihood of engaging in actual repayment behaviour despite having favourable repayment intentions (Ainslie, 1992; O'Donoghue & Rabin, 1999; Meier & Sprenger, 2010). Consequently, hyperbolic discounting is expected to negatively influence student loan repayment behaviour directly. Furthermore, although the Theory of Reasoned Action suggests that intention is the immediate antecedent of behaviour (Ajzen & Kruglanski, 2019), borrowers with stronger hyperbolic discounting tendencies may experience greater difficulty

translating their repayment intentions into actual repayment actions because immediate rewards are perceived as more attractive than future obligations. This suggests that hyperbolic discounting may weaken the positive relationship between repayment intention and repayment behaviour. Beyond this moderating role, hyperbolic discounting may also influence the extent to which financial literacy contributes to repayment behaviour through repayment intention. While financially literate borrowers are generally expected to develop stronger repayment intentions (Lusardi & Mitchell, 2017; Lusardi et al., 2017), the successful translation of these intentions into repayment behaviour may depend on the degree of present-biased preferences exhibited by the borrower. Accordingly, hyperbolic discounting is proposed not only as a direct determinant of repayment behaviour but also as a moderator of the intention-behaviour relationship and the indirect relationship between financial literacy and student loan repayment behaviour.

3. METHODOLOGY

The existing literature commonly uses national surveys like the National Longitudinal Survey, Health and Retirement Study, OECD PISA, ADB Finlit, and World Bank Financial Literacy & Financial Service Survey. However, those studies did not cover two essential factors from our research factors: intention-behaviour discrepancy and hyperbolic discounting behaviour. Those existing surveys also did not capture student loan repayment. We conducted our field survey by interviewing graduate students who are under a student loan due to those limitations. As the first step, we collected the names of Malaysian universities from the Ministry's website. There were 752 higher education institutions (public, private, and polytechnic) in 2018. Each alumni relations office from each university was contacted to assist us in contacting their alumni. Only 29 institutions replied to our email and were willing to help. The issue was that different categories dominated their database: either self-funded or non-self-funded students. We excluded those self-funded or scholarship-funded alumni from our samples. At first, we collected 664 respondents. However, only 391 respondents were in the sample, with the unit of analysis being student loan graduates.

3.1 Goodness of measures

Our questionnaire set was developed by adapting previous research, namely Fishbein and Ajzen (2010), Lusardi et al (2010), Lusardi et al (2012), Ainsle (1992), and Fuchs (1982). The questionnaire items were designed based on multiple-item measurement scales under reflective measurement. Before the hypothesis testing, we examined the goodness of measure of the questionnaire items. We used two main criteria to test the goodness of measure, namely, reliability and validity.

Validity of measures

Heeding the suggestion from Sekaran and Bougie (2010) and Hair et al. (2016), we investigated how well an instrument measures the concept with convergent validity, discriminant validity, and construct validity. First, we tested the convergent validity to reveal the degree to which multiple items measure the same concept. Factor loadings, composite reliability, and average variance extracted (AVE) are the tools for assessing convergent validity (Hair et al., 2016). The rules are: (1) the loadings for all items must be higher than 0.7; (2) the AVE should be greater than 0.5; and (3) composite reliability must be higher than 0.5. Table 2 shows that all our results exceeded the recommended values. This indicated that our items passed the convergent validity.

Table 2. Results of the measurement model

Constructs	Items	Loadings	AVE	CR
ATT	ATT1	0.782	0.554	0.861
	ATT2	0.721		
	ATT3	0.707		
	ATT4	0.727		
	ATT5	0.781		
SN	SN1	0.839	0.632	0.872
	SN2	0.858		
	SN3	0.762		
	SN4	0.712		
FL	FL1	0.835	0.652	0.882
	FL2	0.882		
	FL3	0.713		
	FL4	0.791		
INTEN	INTEN1	0.747	0.648	0.901
	INTEN2	0.72		
	INTEN3	0.741		
	INTEN4	0.898		
	INTEN5	0.899		
HD	HD1	0.786	0.624	0.909
	HD2	0.822		
	HD3	0.77		
	HD4	0.824		
	HD5	0.793		
INTEN*HD	HD6	0.741	0.511	0.969
BEH	Beh1	0.731	0.663	0.907
	Beh2	0.905		
	Beh3	0.829		
	Beh4	0.872		
	Beh5	0.717		

Note: ATT refers to "Attitude towards student loan repayment"; BEH refers to "Student loan repayment behaviour"; FL refers to "Financial Literacy"; HD refers to "Hyperbolic Discounting"; INTEN refers to "Intention to repay student loan repayment"; SN refers to "Subjective Norms".

We then proceeded with discriminant validity. The procedure was carried out by examining the correlation between the measures of potentially overlapping constructs (Compeau et al. 1999). We followed Hair et al. (2016) rule, where the items should load higher on their own construct, and the AVE should be higher than the variance shared between constructs and other constructs. Table 3 revealed that the squared correlation for each construct is less than the AVE, implying an adequate discriminant validity.

Lastly, we examined the construct validity to reveal how well the results obtained from the measure fit the theory (Sekaran & Bougie, 2010). We assessed the construct validity by looking at the respective loadings and cross-loadings. We followed Hair et al. (2016) by using a 0.5 threshold. Our results showed all the items loaded higher than 0.5 in the particular construct and loaded lower on the other constructs, implying confirmation of construct validity. As we have many items (29 tested multiple items), we did not show the results for brevity reasons.

Table 3. Results of the liability test

Constructs	ATT	Beh	FL	HD	INTEN	INTEN*HD	SN
ATT	0.5543						
Beh	0.1388	0.6632					
FL	0.0728	0.00262	0.6525				
HD	-0.1201	-0.695	0.00003	0.6474			
INTEN	0.4858	0.1672	0.1041	-0.1361	0.5708		
INTEN*HD	0.0129	-0.3291	0.0411	0.5784	0.0939	0.5077	
SN	0.3714	0.0987	0.0375	-0.0887	0.3462	0.0078	0.632

Note: ATT refers to "Attitude towards student loan repayment"; BEH refers to "Student loan repayment behaviour"; FL refers to "Financial Literacy"; HD refers to "Hyperbolic Discounting"; INTEN refers to "Intention to repay student loan repayment. The Bold number is the AVE, and the rest is the squared correlation.

Reliability of Measures

This research uses Cronbach's alpha coefficient to assess the reliability of the measurement items. We followed the threshold suggested by Nunnally and Berstein (1994), where the alpha coefficient has to be higher than 0.6. Table 4 reports the results, indicating that all constructs have alpha coefficients higher than the threshold. We also utilised the composite reliability values in Table 2, which ranged from 0.861 to 0.969. Interpreted like Cronbach's alpha, a composite reliability higher than 0.7 implies internal consistency reliability. Hence, our reliability tests implied that the measurement is reliable.

Table 4. Results of the reliability test

Dimension	Cronbach's Alpha	No. of items
Attitude towards student loan repayment (ATT)	0.8	5
Subjective norms (SN)	0.804	4
Financial literacy (FL)	0.82	4
Intention to repay student loan repayment (INTEN)	0.861	5
Hyperbolic discounting (HD)	0.88	6
Student loan repayment behaviour (BEH)	0.871	5

4. RESULTS AND DISCUSSION

4.1 Descriptive statistics

Table 5 presents the summary statistics of the respondents. Note that the main requirement to qualify to receive the loans for most student loans is from the Bottom 40 family. This is the rationale that our respondents were from a family with an income of RM4500 (Median income is RM4,850), with 91.6% of the total respondents. In terms of age, our sample is dominated by 26- to 29-year-olds (56.5%) and 21- to 25-year-olds (30.9%). It fits our problem statement, whereas the Malaysia National Higher Education Fund Corporation reports that the current debt issue is from those cohorts. For the employment status, our sample is dominated by the private sector with 62.1%. It is also aligned with Malaysia's employment demography. Note that we exclude unemployed and full-time postgraduate students because we presume that those groups have no stable income to repay the student loan; hence, it is not suitable for our research context. Lastly, the gender proportion of our sample is slightly different from Malaysia's demography. Our sample consists of 43.7% males and 56.3% females. Meanwhile, Malaysia's gender proportion in 2019 was 52% males and 48% females, respectively. Therefore, we surmise that our sampling summary is robust enough to represent the population.

Table 5. Summary statistics of the respondents

Demography	Frequency	%	Demography	Frequency	%	Demography	Frequency	%
<i>Age</i>			<i>Employment Status</i>			<i>Highest Education</i>		
21 - 25 years	121	30.9	Public Sector	84	21.5	Diploma	79	20.2
26 to 29 years	221	56.5	Private sector	243	62.1	Bachelor's Degree	280	71.6
30 years old and above	49	12.5	Entrepreneurs	64	16.4	Postgraduate	32	8.2
<i>Gender</i>								
Male	171	43.7						
Female	220	56.3						

4.2 Regression results

Table 6 provides the regression results using the PLS-SEM approach. The direct and indirect effects are shown first, as the hypothesis testing of hypothesis 1 (H1) up to hypothesis 12 (H12). To conserve space, we focus on the key variables: financial literacy (H3, H8), hyperbolic discounting (H5), the mediation effect (H11, H10, H11), and the moderation effect (H12).

In Hypothesis 3 (H3: Higher financial literacy increases the intention to repay the student loan), we hypothesise a positive relationship between financial literacy and the intention to repay a student loan. The results in Table 6 support the hypothesis ($\beta = 0.125$, $SE = 0.038$). It suggests that a high financial literacy level induces the intention to repay a student loan. This finding is consistent with Hilgert et al. (2003) and de Bassa Scheresberg et al. (2014).

For Hypothesis 8 (H8), the results do not support a direct relationship between financial literacy and student loan repayment behaviour ($\beta = 0.025$, $SE = 0.041$). While financial literacy positively influences repayment intention (H3), it does not directly translate into repayment behaviour. This finding suggests

that financial literacy alone is insufficient to explain the intention–behaviour discrepancy in student loan repayment.

For Hypothesis 5 (H5), hyperbolic discounting negatively affects student loan repayment behaviour ($\beta = -0.349$, $SE = 0.169$). The finding is consistent with Lochner et al (2016) and Hira et al. (2000), who argued that individuals exhibiting present-biased and time-inconsistent preferences are more likely to experience repayment difficulties or default on their debt obligations. This result reinforces the role of behavioural biases in explaining repayment behaviour beyond traditional rational decision-making factors.

Table 6. Path coefficients and hypothesis testing.

Hypotheses	Paths	Path coefficient	Standard error	T-statistics	P-values
H ₁	ATT → INTEN	0.496	0.046	10.899	0.000**
H ₂	SN → INTEN	0.265	0.043	6.21	0.000**
H ₃	FL → INTEN	0.125	0.038	3.285	0.001**
H ₄	INTEN → BEH	0.439	0.131	3.359	0.001**
H ₅	HD → BEH	-0.349	0.169	2.06	0.04*
H ₆	ATT → BEH	0.022	0.042	0.53	0.597
H ₇	SN → BEH	-0.002	0.036	0.065	0.948
H ₈	FL → BEH	0.025	0.041	0.615	0.539
H ₉	ATT → INTEN → BEH	0.218	0.07	3.108	0.002**
H ₁₀	SN → INTEN → BEH	0.116	0.039	3.009	0.003**
H ₁₁	FL → INTEN → BEH	0.055	0.024	2.261	0.024*
H ₁₂	INTEN*HD → BEH	-0.163	0.064	2.544	0.011*

Note: ATT refers to Attitude towards student loan repayment, SN refers to Subjective Norms, FL refers to Financial Literacy, HD refers to Hyperbolic Discounting, INTEN refers to Intention to repay student loan repayment, and BEH refers to Student loan repayment behaviour

4.3 Results for mediating effect

We next proceed to the mediation test (H10, H11). In this study, the intention to repay student loans acts as the mediating role while examining the effects of attitudes towards student loan repayment, subjective norms, and financial literacy on the actual behaviour towards student loan repayment. We employed the Sobel test and bootstrapping as the statistical inference tools for the mediating effect. To do so, the Sobel test took into account the calculation of the regression coefficient and standard error for both the association between the independent variable and mediator, together with the association between the mediator and dependent variable. Table 7 reports our Sobel test results.

The Sobel test requires the assumption that the p-value is derived from a normal distribution. Due to this constraint, this study has analysed the intervening variable effects using bootstrapping. Bootstrapping was tested to be one of the more valid methods and has higher power compared to other methods (Bollen & Stine, 1990). The bootstrapping procedure is a non-parametric inferential method that randomly extracts several subsamples through resampling from the original dataset (Cepeda-Carrion et al., 2017).

By adopting bootstrapping to test mediating effects, the first test done was to test the indirect effect between the independent variable and the mediator. Note that there are three indirect effects tested in this study. The first indirect effect test is that the intention to repay student loans is the mediating factor for the relationship between attitudes towards student loan repayment and the actual behaviour of student loan repayment. The second indirect effect test refers to the mediating effect of intention on the relationship between subjective norms and the actual behaviour of student loan repayment. The last mediating test is the mediation model for the indirect effect of financial literacy on student loan repayment behaviour mediated by the intention to repay student loans.

Table 7. Results of the Sobel Test.

Variables	A	B	SEa	SEb	Sobel test statistics	p-value
Attitudes towards student loan repayment	0.496	0.439	0.046	0.131	3.2	0.001**
Subjective norms	0.265	0.439	0.043	0.131	2.944	0.003**
Financial literacy	0.125	0.439	0.038	0.131	2.348	0.019*

Table 6 reports that the role of intention to repay student loans works well as the mediator in this study. For H9, our results revealed that attitude towards student loan repayment positively influenced student loan repayment behaviour with intention as the intervening variable ($\beta = 0.218$, $t\text{-value} = 3.108$). It implies that a higher attitude towards student loan repayment induces repayment behaviour when intention intervenes in the relationship.

The results for H9 concluded the same. It shows the mediating effect of intention on the relationship between subjective norms and student loan repayment ($\beta = 0.116$, $t\text{-value} = 3.009$). We then surmise that a stronger influence of social norms leads to student loan repayment when there is a mediating effect (intention to repay) among the variables. Our results extended the findings from Almenberg et al (2018), who argued that debt attitude was not only influenced by family lines and social norms, but also needs intention to repay as a mediator. Without the mediation of intention to repay, subjective norms do not affect the student loan repayment behaviour.

For our main focus, H11, we sought an explanation for why financial literacy does not affect the actual behaviour of student loan repayment (H8). The results from Table 6 reported that financial literacy will induce the actual behaviour if there is a mediation effect of intention to repay ($\beta = 0.055$, $t\text{-value} = 2.261$). In other words, if we aim to make financial literacy work for the actual behaviour of student loan repayment, it needs intention to repay to mediate that relationship. This means that when high financial literacy increases intention, it will also increase the actual behaviour of student loan repayment.

The mediation effect results in Table 6 imply full mediation. The results indicated that if the indirect effect between independent variables (attitude, subjective norms, and financial literacy) and intention to repay is significant, the independent variables do not influence the actual behaviour to repay. In other words, the relationship between the independent variable and dependent variable can only exist via the mediator (Cepeda-Carrion et al., 2017). Therefore, the effect of attitude towards education loan repayment on behaviour towards student loan repayment is valid via the mediation of the intention to repay student loans.

4.4 Results for moderation effect

The next hypothesis testing is related to the moderation effect (H12: The moderating role of hyperbolic discounting would weaken the relationship between intention to repay student loans and student loan repayment behaviour). Table 6 shows that the coefficient for the product term (INTEN*HD) has a significant path ($\beta = -0.163$, $t\text{-value} = 2.544$); hence, H12 is supported. The path coefficient for the product term shows a negative relationship with the dependent variable. It indicates that the positive relationship between intention and actual behaviour of repayment would be weakened by the presence of hyperbolic discounting. Higher present bias behaviour of the borrowers will discount the positive effect of intention on actual behaviour. In other words, hyperbolic discounting might induce the intention-behaviour discrepancy of student loan repayment.

Apart from testing the significance of the moderation effect, plotting the moderation effects helps in understanding moderation. The plotted graph demonstrates how the slope of the dependent variable (DV) on the independent variable (IV) depends on the value of the moderator variable (MV) (Fairchild & Mackinnon, 2009). The simple slopes are the regression slopes that relate the prediction of DV from IV at a single value of MV (Aiken et al., 1991).

The simple slope plot in Figure 2 depicts the moderation effect. There are three lines presented in the graph that represent the relationship between intention to repay student loans (x-axis) and student loan repayment behaviour (y-axis). The line in the middle shows the relationship for an average level of hyperbolic discounting. The other two lines are the results of plotted scores for intention to repay student loans at lower (mean value of hyperbolic discounting minus one standard deviation unit) and higher (mean value of hyperbolic discounting plus one standard deviation unit) levels of the moderator variable hyperbolic discounting. This research follows the recommendation by Cohen et al. (2003), where the usual practice to plot predicted values for the dependent variable is by selecting representative groups at the mean and at low values that are represented by -1 SD from the mean and high (+1 SD from the mean) values of the continuous variable.

The upper red line shown in Figure 2 represents a low level of the moderator variable hyperbolic discounting, while the lower line in green represents a high level of the moderator variable hyperbolic discounting. This is because the hyperbolic discounting effect on student loan repayment behaviour is detected to be negative. All three lines plotted are shown with positive slopes. It indicates a positive association between intention to repay student loans and student loan repayment behaviour, whereby higher intention to repay student loans leads to higher levels of student loan repayment behaviour.

Besides, by further analysing the pattern of the slopes, it shows that the upper line has a steeper slope. The slope of the low level of the moderator variable (-1 SD) is the direct effect of intention to repay student loan (i.e., 0.439) minus the moderating effect (i.e., -0.163). Meanwhile, the slope of the high level of the moderator variable (+1 SD) is the direct effect of intention to repay student loan (i.e., 0.439) plus the moderating effect (i.e., -0.163), which explained the flatter slope shown on the lower line. This coefficient of the product term can cause this scenario because it is negative. Hence, the simple slope plot also supports the negative moderation product term for the model for this study. In other words, higher hyperbolic discounting leads to a weaker association between intention to repay student loans and student loan repayment behaviour, while lower levels of hyperbolic discounting lead to a stronger association between intention to repay student loans and student loan repayment behaviour.

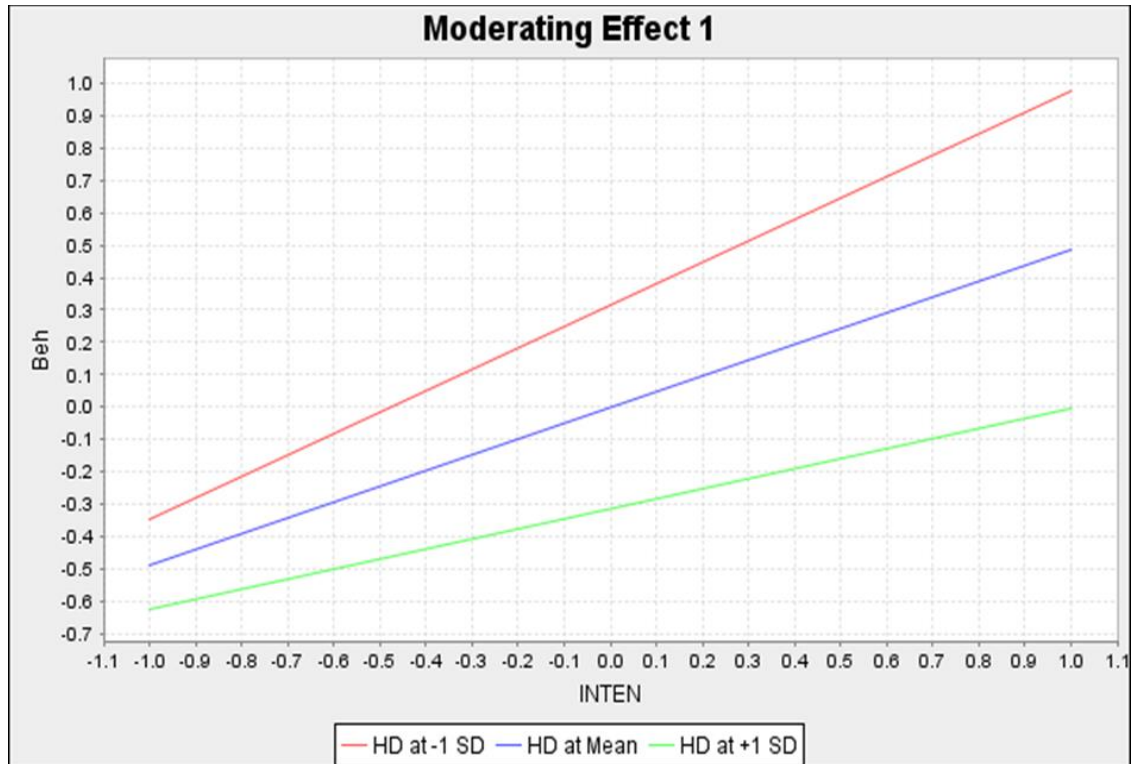


Fig. 2. Moderation effect plot.

4.5 Moderated mediation analysis

The model of this study has discussed mediation and moderation analyses separately. However, moderated mediation analysis, also known as the conditional indirect effect, could be an advancement made beyond the separate analysis of mediating and/or moderating effects and to understand the simultaneous mechanisms of the inferential and interaction effects (Hayes, 2013). Therefore, this study has conducted a test on moderated mediation.

Moderated mediation was tested for this study to determine whether indirect effects between attitudes towards student loan repayment, subjective norms, and financial literacy (independent variables) together with student loan repayment behaviour (dependent variable) via intention to repay student loan (mediator variable) would be different by the value of hyperbolic discounting (moderator variable). To test moderated mediation, this study used the PROCESS macro by Hayes (2013) that operated under SPSS. PROCESS macro supports the use of bootstrapping when testing moderated mediation effects by referring to the index of moderated mediation, and the condition to test the significant moderated mediation effect is by looking at the confidence index that excludes zero (Hayes, 2013).

Table 8 shows that the moderated mediation effect of financial literacy on student loan repayment behaviour through repayment intention is conditional upon the level of hyperbolic discounting. The significant index of moderated mediation ($\beta = -0.015$, Boot SE = 0.007, 95% CI [-0.032, -0.003]) supports H13, indicating that the positive indirect effect of financial literacy weakens as hyperbolic discounting increases. This finding suggests that although financially literate borrowers are more likely to develop

favourable repayment intentions (Lusardi & Mitchell, 2017; Lusardi et al., 2017), stronger present-biased preferences may hinder the translation of these intentions into a actual repayment behaviour (Ainslie, 1992; O'Donoghue & Rabin, 1999).

Table 8. Results of the moderated-mediation effect.

Moderated mediation index	Effect	95% Confidence Interval	
		Lower limit	Upper limit
Attitude towards student loan repayment	-0.0602	-0.1293	0.0048
Subjective norms	-0.0444	-0.1044	0.0138
Financial literacy	-0.0174	-0.0481	0.0103

4.6 Attitudes Towards Student Loan Repayment, Subjective Norms, and Intention to Repay

Additionally, this section provides the regression results for the effect of attitude towards student loan repayment (H1 and H6) and subjective norms (H2 and H7) on the intention and a actual behaviour of student loan repayment. It also reports the relationship between intention to repay and a actual repayment behaviour (H4).

Regarding a attitude towards student loan repayment, Table 6 reveals that attitude positively affects the intention to repay ($\beta = 0.496$, $t\text{-value} = 10.899$). It suggests a confirmation of our hypothesis 1 (H1). However, our results also indicate that attitude does not affect the actual behaviour of loan repayment, suggesting a rejection of our hypothesis 6 (H6). Thus, we conclude that a high a attitude towards student loan repayment leads to high intention to repay the loan, but it does not directly influence the a actual behaviour.

For the subjective norms, Table 6 reports a similar conclusion to the attitude effect. At first, the subjective norm has a positive effect on the intention to repay the educational loan ($\beta = 0.256$, $t\text{-value} = 6.210$). However, the subjective norm does not influence actual behaviour. It implies we only accept H2 and reject H7. The social pressure from family, relatives, friends, or society might increase the intention to repay, yet it does not significantly affect the a actual behaviour.

Lastly, we also test the direct effect of the intention to repay on the actual behaviour (H4). The results in Table 6 supported the hypothesis by showing a positive relationship ($\beta = 0.439$, $t\text{-value} = 3.359$). When borrowers have a high intention to repay the student loan, it positively influences their a actual behaviour. This result is consistent with the Theory of Reasoned Action, where people should perform the behaviours when they have a high intention to perform them (Fishbein & Ajzen, 1975).

5. CONCLUSION AND RECOMMENDATION

Our study examines the rationale behind the intention-behaviour discrepancy of student loan repayment by introducing financial literacy and hyperbolic discounting in the research framework. We conceptualised and tested the hypotheses under the Theory of Reasoned Action (TRA) framework. The main focus was to reveal how financial literacy and hyperbolic discounting might explain that discrepancy. Using PLS-SEM, our results revealed an exciting conclusion. Figure 3 portrays our final remarks.

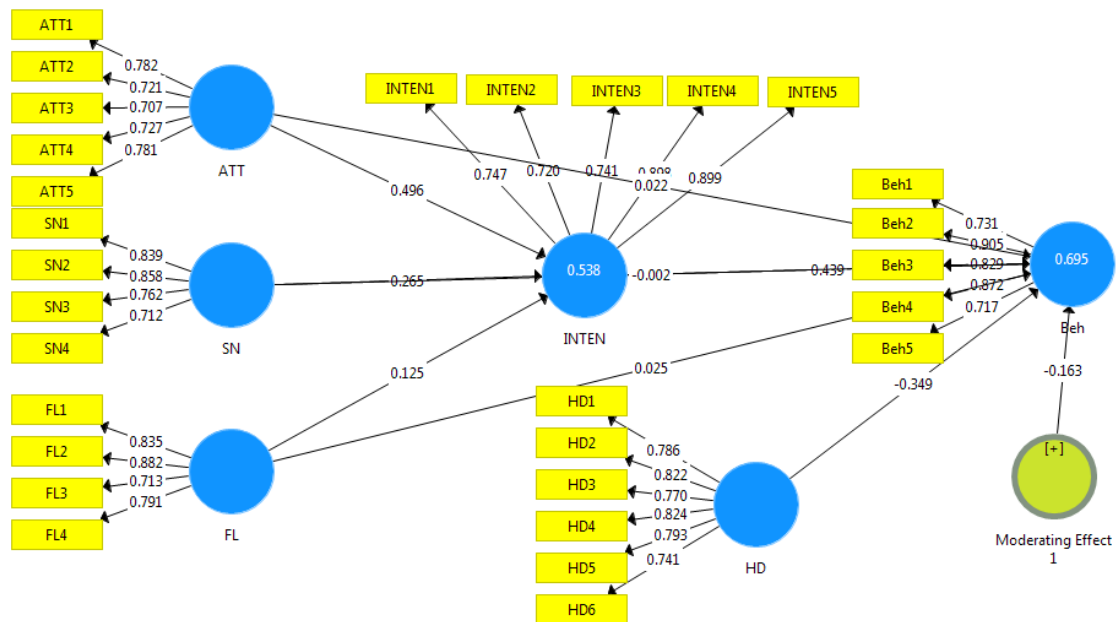


Fig. 3. Full regression result model.

First, the level of financial literacy is essential for the intention to repay the student loan, yet it does not affect the actual behaviour. Our findings are aligned with the previous studies from Almenberg et al. (2018), Lusardi and Tufano (2009), and Hilgert et al. (2003). Interestingly, when we tested the indirect effect using intention as the mediating variable, financial literacy positively affected student loan repayment. It implies that if policymakers aim to induce student loan repayment, they still need financial literacy as the key factor. However, they also must ensure that financial literacy induces the intention to repay to improve student loan repayment behaviour. It tells us that we must increase the students' financial literacy level, not directly for the actual behaviour of student loan repayment, but to induce the intention to repay first. This is because when the intention to repay increases due to the high level of financial literacy, the actual behaviour of student loan repayment will increase.

Second, the presence of cognitive bias, such as hyperbolic discounting, may harm student loan repayment. This hedonic utility decreases repayment behaviour. It also weakens the positive effect of intention to repay on the actual repayment behaviour. Previous studies (Huffman & Barenstein, 2005; Diamond & Köszegi, 2003; Prelec & Loewenstein, 1998; Laibson, 1997) suggested that financial planning, pre-commitment, and mental accounting may play an important role in reducing this bias. It is consistent with the study of Findley and Caliendo (2015), who stated that time-inconsistent preferences have explained the trend of procrastination and failure to perform. Therefore, better education related to financial psychology will help to reduce hyperbolic discounting. With a low level of hyperbolic discounting, the student loan repayment issue would decrease.

Finally, we aimed to examine the moderated mediation effect of hyperbolic discounting on the path coefficient from financial literacy. The purpose was to reveal if financial literacy level may reduce the hyperbolic discounting effect on the intention-behaviour discrepancy. Our results revealed that hyperbolic discounting has not significantly moderated the mediating effect in the model. Thus, this concludes that

there is a mediating effect in this study, and the effect does not depend on the moderator's value. In other words, financial literacy is still the key factor for the intention-behaviour discrepancy. The effect of financial literacy on student loan repayment may lower the effect of hyperbolic discounting.

Future research may look into different theoretical and research settings to verify our present research estimation. The focus of this study was to examine student loan repayment within the TRA framework. However, our study was limited to the scope of the TRA framework. A few extensions can be further built upon our findings. For example, student loan repayment can be further examined in-depth through the commitment theory, moral hazard theory, or cognitive dissonance theory. Secondly, cohort, generation gap, and gender analysis can be another interesting extension of the study for this analysis. Finally, the presence of a student loan marketplace startup will also enrich the body of knowledge, which can be carried out for future study.

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7. CONFLICT OF INTEREST STATEMENT

The authors declare that there are no conflicts of interest associated with this research.

8. AUTHOR'S CONTRIBUTIONS

Jane Seok-King Ling conducted the research and was responsible for drafting and designing the study. **Rayenda Khresna Brahmana** developed the core research concept and contributed the theoretical framework. **Azra Tilai** and **Nur Farrahanie Ahmad Tarmizi** provided supervisory oversight of the research process and critically revised the manuscript.

9. DECLARATION OF GENERATIVE AI IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used ChatGPT (OpenAI) as an AI-assisted language and writing support tool to improve language clarity, readability, grammar, and overall presentation. The use of the tool was limited to language refinement and did not replace the authors' scholarly judgement, interpretation, analysis, or responsibility for the research content. The author(s) critically reviewed and revised the output as appropriate and take full responsibility for the originality, accuracy, integrity, and final content of the publication.

10. DATA AVAILABILITY/ SUPPLEMENTAY MATERIALS

The authors are grateful to the reviewers and editors for their constructive comments, which contributed to improving the manuscript.

11. ETHICS STATEMENT

The authors declare that this research did not involve human or animal subjects. All experimental procedures were performed following the institutional Safety, Health, and Environmental (HSE) protocols of Universiti Teknologi MARA.

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