The nexus between households' indebtedness and consumption: the role of gender, geographical area and income groups

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Abstract

Purpose – The persistent increase in household indebtedness is an alarming issue that is becoming a major concern for economists and governments in developing nations. Although household consumption is an essential source of economic growth, households' failure to meet their financial obligations will be one of the causes of economic problems if the increase in consumption is largely financed by household borrowing. Therefore, this study aims to analyse the nexus between households' indebtedness and consumption and the roles of household characteristics.

Design/methodology/approach – This study uses a microdata set of the Household Expenditure and Income Survey in 2019, which contained a simple random sampling of 4,730 households.

Findings – Using a simultaneous equations model, our results show a negative nexus between households' consumption and their indebtedness. We find that household savings and size have an indirect impact on the debt service ratio, while the assets and total debt repayment instalments indirectly influence household consumption. We also identify differences in the relationship between the gender of the household head, rural and urban locations and income groups in consumption and indebtedness.

Research limitations/implications – The implication of this study is that governments should adopt several programmes to increase the awareness of household financial and debt management, especially for those in the low-income group.

Originality/value – This study contributes to the empirical literature by establishing a microeconomic perspective of consumption and an indebtedness model focusing on the differences in household characteristics in explaining consumption and indebtedness.

Keywords Debt service ratio, Simultaneous equation model, Household consumption, Household characteristics, Household indebtedness

Paper type Research paper

1. Introduction

Over the past three decades, households' indebtedness has been steadily increasing in Malaysia. Moreover, many researchers have found that most countries are facing rising numbers of indebted households. For example, the household debt-to-gross domestic product (GDP) ratios in South Korea, Singapore, Hong Kong, Chile, Thailand and China rose by more than 40% between 1995 and 2018 (Abd Samad *et al.*, 2020). The domestic economy has shown signs of stress and external headwinds over the past few years. Housing prices, in particular, have been increasing steeply since 2011 (Kumar, 2020). According to the Central Bank of Malaysia, the ratio of house price to annual income rose sharply from 3.9 times in 2012, to 4.8 times in 2016 and to 4.0 times in 2019. Therefore, the rapid rise in household indebtedness has led countries to fear that households' resilience to adverse shocks is deteriorating.

Based on some countries' experiences in the global financial crisis, the risk of a financial crisis and economic instability increases significantly as household debt levels rise. A high level of household debt may pose significant risk to macroeconomic performance and financial stability. One possible channel for the adverse effect of a high level of indebtedness is households' ability to smooth their consumption and influence business investment. There are two competing views on the effect of household debt on consumption through a variety of channels. According to one point of view, rising household debt levels lead to an expansion of consumption, helping to stimulate the economy. Increased competition among lenders also leads to an expansion of credit because lower borrowing costs result in easier access to credit facilities, causing higher consumption (Prinsloo, 2002). In addition, high levels of lending could worsen the country's economic performance by making the banking sector vulnerable in the event of any negative shocks to the economy (Buch and Drages, 2018).

More recently, household debt levels have become increasingly concerning for the low- and middle-income groups. The continued rise in household debt is a cause of serious concern among economists and governments. Specifically, highly indebted households of low- and middle-income groups may end up being unable to handle their debts, leading to debt defaults, thereby contributing to the financial crisis and affecting the country's financial stability. Nevertheless, high debt-holding among households of high-income groups is less concerning as this group tends to borrow for the purpose of acquiring income-generating assets such as properties and financial assets which in turn helps them to cover the debt service. Therefore, the Friedman's (1957) Permanent Income Hypothesis (PIH) that higher debt means higher expected income presumably applies to this income group. Moreover, high-income households tend to have a higher debt holding because they can afford to repay the loans. With the rapid development of the economy and the acceleration of urbanisation, household consumption plays an essential role in a country's economic growth. Although household consumption is an essential source of economic growth, if the

increase in consumption is primarily financed by household borrowing, then households' failure to meet their financial obligations could hamper long-term growth. As the debt service ratio rises, households spend less to maintain their finances, dampening economic growth. In 2015, Malaysia's household indebtedness reached 86.9%, which was recorded as one of the highest in the Asian region, and records show that 5,547 individuals under the age of 35 were declared bankrupt (Malaysian Department of Insolvency, 2016).

Empirical studies have provided inconclusive evidence on the relationship between households' consumption and their indebtedness. Atalay et al. (2017) studied the impact of high household indebtedness on consumer expenditure based on household expenditure and used the survey data from Household, Income and Labour Dynamics in Australia (HILDA). They indicate that households with high indebtedness experienced a sharper reduction in their consumption following the crisis than average households, especially for younger households. However, Andersen et al. (2016) examined Danish household data and found that households with high leverage consumed more than households with low leverage before the crisis because of a higher marginal propensity to consume (MPC). In other words, households are in debt for consumption needs, and they consider debt part of their financial capacity.

At the micro level, very few studies have examined the simultaneous nexus between households' indebtedness and their consumption in developing countries, especially Malaysia. Hence, we have limited information about the two-way effect of households' consumption and indebtedness. On the contrary, most reports fall into the category of "grey literature", implying that the findings are still not stable and strong enough to describe the phenomenon of households' indebtedness and consumption in developing countries. Previous studies have also paid less attention to the role of households' characteristics, such as income groups, the gender of the household head and the location, as determinants of households' consumption and indebtedness. We predict that households' characteristics will have varying impacts on our variables of concern. The rational argument is that households' characteristics such as gender, geographical area and income groups would give a different respond towards consumption and indebtedness decision (Baker, 2015).

Therefore, by considering the importance of the issues of tremendous household debt and resilient of consumption, the aim of the study is to examine the simultaneous relationship between households' characteristics, indebtedness and consumption. Specifically, we investigate whether households' savings and size have an indirect impact on the debt service ratio and whether the total debt repayment and assets indirectly affects households' consumption, and finally we study the impact of households' characteristics on this nexus. The findings of this study contribute to a more nuanced understanding of the gravity of rising household indebtedness and consumption levels in Malaysia, thus bridging some research gaps in this area.

The rest of the discussion for this study will be organised as follows. Section 2 reviews the extant theoretical literature, related hypotheses and empirical studies on households' characteristics, indebtedness and consumption. Section 3 describes the investigation process and data measurement based on previous theories and methods and is followed by Section 4, in which we present the empirical results and discuss the findings obtained to answer the research questions outlined in this study. Finally, Section 5 concludes the study by summarising the rectified issues, recommendations and policy implications and suggestions for future research.

2. Literature review
According to Keynes (1936), aggregate consumption is a positive but critical function of income. However, Duesenberry's (1949) study of Income, Saving, and Consumer Behaviour,

published in 1949, challenged Keynes's theory of consumer behaviour, introducing the psychological factors related to habit formation and social interdependence regarding relative income. However, Friedman (1957) proposed the PIH, which argues that households will spend a fixed proportion of their permanent income on consumption. Moreover, in the life cycle hypothesis (LCH), Modigliani (1966) points out that consumption is driven by predictable and rational households, and their consumption expenditure results from an intertemporal optimisation process aiming to maximise the utility of the life cycle. Consumer credit can act as a neutral instrument, promoting the transfer of lifetime income and wealth and making consumption smoother to pursue utility maximisation. Therefore, household income and wealth are most associated with household consumption in the long term. Nevertheless, according to Hall (1978), after the above intertemporal optimisation and smoothing, consumption follows a random walk in the short term. He pointed out that, if Milton Friedman's PIH is correct, then the current income should be thought of as the total of permanent and ephemeral income, with the consumption being largely determined by the permanent income. If a consumer has rational expectations, then any change in consumption should be unpredictable, and this is known as the random walk model of consumption.

From an economic perspective, explanations of household debt behaviour are thought to be rooted in consumption theory. According to the mainstream consumption theory and the LCH, household debt results from utility maximisation. The theory assumes that debt levels can be determined by socioeconomic factors such as households' age, their expectations of future income and their size. Households will borrow according to their future income expectations to smooth their lifetime consumption. This leads to relatively high levels of debt among young people, which will start to decline as they age.

Although consumerism and debt accumulation are positively associated with aggregate demand, hence economic growth; this relationship is however unsustainable from the financial stability perspective (Setterfield and Kim, 2016). The credit system might question the creditworthiness of highly indebted households, which could lead to decreasing credit supply and/or rising financial fragility and finally a financial crisis. A recent study by Leclaire (2021) shows that unsustainable household debt jeopardises financial stability by affecting household consumption levels, the rates of return on mortgages, and banking sector balance sheet. Jordà et al. (2013) document that household debt expansion with rapid credit build ups can lead to a deeper recession in advanced countries. Additionally, the increasing cost of interest and principal payments will be a burden for households. Such adverse effects of household indebtedness have been modelled in recent studies (Detzer, 2016; Setterfield and Kim, 2016; Belabed et al., 2018).

The empirical evidence on the relationship between household indebtedness and consumption in Organization for Economic Cooperation and Development (OECD) countries is mixed. Jauch and Watzka (2012) determined the impact of Spanish households' debt on the level of aggregate demand based on a transnational study of 18 European countries, finding that a high level of debt forces households to adjust their balance sheets and decrease their spending. Estrada et al. (2014) conducted a similar study, taking OECD countries as samples, to investigate how the development of household debt affects private consumption. They found that household indebtedness causes household consumption to increase after holding the impact of interest rates, incomes and wealth constant; deleveraging leads to reduced total consumption. However, Yunchao et al. (2020) argued that higher levels of household debt have not led to a significant decrease in household spending. The results regarding household spending differ from those of previous studies, which have generally found, using data collected during and after recessions, that an increased level of debt causes significantly reduced consumer spending.

Furthermore, Lombardi *et al.* (2017) pointed out that liquidity and credit constraints lead to leverage that may inhibit household consumption behaviour and adversely affect consumption. In the same vein, studying household data in the USA, Dynan and Edelberg (2013) documented that household leverage would damage consumer spending behaviour, mainly because exceeding their leverage would reduce the possibility of consumers gaining further access to consumer credit. Meanwhile, Baker (2018) stated that income compensation from bank loans or other sources of leverage will increase households' current propensity to consume, thus having a positive impact.

Also, empirical studies have mostly focused on the consumption of households with a high level of debt. La Cava and Price (2017) used HILDA data from 2001 to 2015 and concluded that the debt levels were high and debt servicing is low relative to income and assets' ability reduced the growth of household spending relative to income. As a result, they pointed out that high debt levels of households were more sensitive to income and home equity than low debt levels of households. Furthermore, they reported that the impact of a high level of debt on decreasing household consumption is more likely to expose households to stringent borrowing restrictions or greater uncertainty during adverse shocks. In addition, Price *et al.* (2019) used panel data to examine the nexus between owner-occupied consumption and mortgage debt. The results showed that households typically cut back on spending when the level of outstanding mortgage debt is high, which is referred to as the debt overhang effect.

Moreover, Albayrak (2020), Costa and Farinha (2012) and Kim and Hwang (2016) considered how the asset ownership and characteristics of households influence the relationship between household indebtedness and consumption differently. In detail, Costa and Farinha (2012) analysed Portuguese households' indebtedness based on microeconomic information from the Household Finance and Consumption Survey (HFCS). An analysis of the distribution of debt ratios regarding household characteristics showed that the most vulnerable situation occurs in the lowest income and age groups, when these households hold mortgages, and especially when they also hold other debts. The proportion of households with very high debt-to-income ratios is enormous in the lowest income group and among the youngest borrowers who have recently taken on debt. Households in the lowest income group are likely to spend more and to have high debt-to-income ratios, which are usually relatively modest among the youngest households.

Besides that, Kim and Hwang (2016) examined household debt and consumer spending in Korea. They found that the dampening influence of indebtedness on consumption may vary by consumer expenditure type and household characteristics. In other words, the consumer spending of highly indebted households may be more vulnerable than that of low-indebted or non-indebted households. Thus, the results show that debtors' adjustment to consumer spending in high-income groups is more substantial than that in low-income groups.

Additionally, Albayrak (2020) investigated whether income inequality within the reference group of relative income and household characteristics affects household consumption. They controlled for household income groups, the age, gender and educational level of the household head, the number of household members as a proportion of the total household size, and the regional age group. Thus, relative income is essential for household consumption behaviour after controlling for absolute income levels and other household characteristics. They found that household consumption was negatively correlated with measures of relative income and positively correlated with income inequality in the reference group. In addition, when inequality was used as the reference group, household debt had a positive impact on household consumption.

3. Research methods and materials

3.1 Source of data and sample

This study uses the secondary data collected by the Department of Statistics Malaysia (DOSM) through a survey of 4,730 Malaysian households in 2019. The sample used in this study comprises 15% of the database from the Household Expenditure and Income Survey 2019 in Malaysia, the selection of which is based on the simple random sampling method. The variables used in this study are household consumption (the sum of household consumption expenditure and non-consumption expenditure), household income (total household income, net income tax, wealth tax and social contributions and monetary social benefits), savings (household income minus consumption of goods and services) and total debt repayment instalments (liabilities payable in the future, which include loans for the purchasing of real estate and financing consumption, such as car and personal loans), and all data denominated in Ringgit Malaysia. Also, household size [the number of private households (persons)], assets [all new or used goods, such as vehicles (units)], the debt service ratio [total monthly commitment divided by total gross income (ratio)] and a set of household characteristic variables, which consist primarily of demographic information on the households collected through the survey.

3.2 Method of analysis

This study aims to determine the exposure of households' consumption and indebtedness in Malaysia to examine the simultaneous relationship between households' consumption and their indebtedness and to investigate whether the household savings and size have an indirect impact on the debt service ratio and the assets and total debt repayment instalments, indirectly affecting household consumption. Therefore, the analysis of data in this study will be conducted using the simultaneous equations model (SEM). The findings will be analysed and reported through statistical inference.

3.3 Simultaneous equation model

This study estimates only the household consumption equation, but the exogenous variables in the debt service ratio equation are used as instruments. While estimating only the debt service ratio equation, the exogenous variables in the household consumption equation are used as instruments. To solve the endogeneity problem and achieve this study's goal, cross-sectional data are submitted to the SEM, and two-stage least squares (2SLS) regression is used for the instrumental variable (IV) estimation (Schendel and Patton, 1978). The equation below shows the 2SLS method used to treat the simultaneous equations and their structural model and reduced form.

The structural form provides estimations for the second stage when solving simultaneous equations. The structural model in this study demonstrates the consumption and debt behaviour of households at the micro level using econometric approach. Each model consists of two equations with two dependent variables: the debt service ratio and household consumption.

Equation (1) depicts the relationship between consumption and income, hence is termed as the consumption function. In other words, the consumption function shows that when household income rises, household consumption also increases. From the intertemporal consumption viewpoint, the function can explain people's preferences in relation to consumption and saving over the course of their lives. An increase in the household savings will cause consumption to decrease because household prefer to save for the future life. Moreover, household size is one of the factors that lead to increased consumption. As the number of children increases, the amount of money consumed on goods and services increases as well.

Next, equation (2) shows that when household income increases, it leads to an increase in the debt-service ratio because they are willing to consume more luxury goods and services. Additionally, debt service ratio can capture the link between consumption expenses and debt payments. Apergis (2019) examines the debt-service ratio's role as a leading indicator of households' consumption. The results show that high consumption leads to a high debt service ratio, especially durable goods have a greater impact. Furthermore, household indebtedness are liabilities payable in the future which includes loans for purchasing of real estate and securities, financing consumption such as car and personal loans and credit card (Bank Negara Malaysia, 2014). Also, an increase the number of household assets purchases such as houses, bank loans are required, which leads to an increase in the debt service ratio.

We also incorporate in our model several factors, namely, household characteristics such as gender of household head (male and female), location (rural and urban) and income groups (low, middle and high) that potentially have different influence on household consumption and debt service ratio. According to Tifferet and Herstein (2012), women exhibit a higher level of brand commitment than men. They are also more impulsive than male shoppers. However, Meyers-Levy and Loken (2015) point out that male consumers sometimes spend more money than women as a way to show their social status. The majority of household heads in Malaysia are males, and they tend to predominate in households in terms of expenditure in goods and services for family members. Intuitively, debt service ratio for males should be higher than that of females. In regard to the location factor, it is common that the cost of living such as housing rents or prices, food and others are much higher in urban areas than in rural areas. Therefore, there are huge differences in living costs between rural and urban areas and indirectly affecting differences in consumption and debt service ratio as well. In term of income groups, household consumption and debt service ratio in lower- and middle-income groups are normally lower than higher income groups. Hence, higher-income groups are willing and more flexible in making their consumption pattern decisions than lower- and middle-income groups. Thus, household with higher income have seen increases in their consumption of luxuries goods and services (Henry, 2014) and they automatically make a lot of loans for investment to generate future income.

Endogenous variables are variables that depend on other variables or become an explanatory variable in another equation in an economic model. In this study, the endogenous variables are the HC and DSR, whereas the exogenous variables are the Y and HCH. The instruments are LFA, SIZE, TINS, and AS. Both endogenous and IV are independent variables in the given equation, as shown in the following formulas:

$$HC_i = \beta_0 + \ \beta_1 DSR_i + \beta_2 Y_i + \beta_3 LFA_i + \beta_4 SIZE_i + \beta_j \sum_{j=1}^{3} HCH_{ij} + \varepsilon_{1i} \tag{1}$$

$$DSR_i = \alpha_0 + \alpha_1 HC_i + \alpha_2 Y_i + \alpha_3 TINS_i + \alpha_4 AS_i + \alpha_j \sum_{j=1}^{3} HCH_{ij} + \varepsilon_{2i} \tag{2}$$

The variables need to transform equations (1) and (2) into the natural-log form to make equations (3) and (4) estimable. We apply the natural logarithms for data distribution because some values are too large for some periods and too small for others and the data are measured in different units. Apergis (2019) examined the role of the debt service ratio as a leading indicator of households' consumption. He modified the consumption equation to

interact changes in income with a variable that measures household debt repayment using the natural logarithm of all the variables, such as the household consumption, debt service ratio, labour income and housing prices. In this study, we apply natural logarithms to all the variables, and the estimable form of the equation is modelled as follows:

$$logHC_i = \beta_0 + \beta_1 logDSR_i + \beta_2 logY_i + \beta_3 logLFA_i + \beta_4 logSIZE_i + \beta_j \sum_{j=1}^{3} HCH_{ij} + \varepsilon_{1i}$$

(3)

$$logDSR_i = \alpha_0 + \alpha_1 logHC_i + \alpha_2 logY_i + \alpha_3 logTINS_i + \alpha_4 logAS_i + \alpha_j \sum_{j=1}^{3} HCH_{ij} + \varepsilon_{2i} \quad (4)$$

where $logHC_i$ is the natural log of household consumption, $logDSR_i$ is the natural log of the debt service ratio, $logY_i$ is the natural log of household income, $logLFA_i$ is the natural log of household savings, $logSIZE_i$ is the natural log of the household size, $logTINS_i$ is the natural log of the total debt repayment instalments, $logAS_i$ is the natural log of assets and $\sum_{j=1}^{3} HCH_{ij}$ just indicates the households' characteristics of income groups, the gender of the household head and the location, which are dummy variables in this study. Besides these, β and α are the parameters to be estimated and the error terms ε_{1i} and ε_{2i} are assumed to have a normal distribution.

3.4 Reduced form model
When solving simultaneous equations, the first estimator/least squares coefficient is given in the reduced form. The reduce-form equation only expresses the endogenous variable as a function of the exogenous variables. In addition, the reduced form includes all the IVs in each equation. Therefore, the debt service ratio and household consumption are dependent variables and the exogenous variables and all the instruments, such as LFA, TINS, SIZE, AS, Y and HCH, are independent variables in this form. Then, the model becomes:

$$logHC_i = \pi_{10} + \pi_{11} logLFA_i + \pi_{12} logTINS_i + \pi_{13} logSIZE_i + \pi_{14} logAS_i + \pi_{15} logY_i$$

$$+ \beta_j \sum_{j=1}^{3} HCH_{ij} + \mu_{1i}$$

(5)

$$logDSR_i = \pi_{20} + \pi_{21} logLFA_i + \pi_{22} logTINS_i + \pi_{23} logSIZE_i + \pi_{24} logAS_i + \pi_{25} logY_i$$

$$+ \alpha_j \sum_{j=1}^{3} HCH_{ij} + \mu_{2i}$$

(6)

where $logHC_i$ is the natural log of the household consumption for cross-sectional i, $logDSR_i$ is the natural log of the debt service ratio for cross-sectional i, $logLFA_i$ is the natural log of liquid financial assets (savings) for cross-sectional i, $logTINS_i$ is the natural log of the total debt repayment instalments for cross-sectional i, $logSIZE_i$ is the natural log of the household size for cross-sectional i, $logAS_i$ is the natural log of assets for cross-sectional i, $logY_i$ is the

natural log of the household income for cross-sectional i, HCH_i is the household characteristics for cross-sectional i, π is the coefficients of the variables and μ_i is the error term for cross-sectional i.

3.5 Empirical model

The IV estimators provide a method to obtain consistent parameter estimates. Used widely in econometrics but rarely elsewhere, this method is conceptually tricky and prone to misuse. It provides lengthy declarative processing, the derivative of IVs and an explanation of how IV methods work in a simple setting. The purpose of derivatives of IVs in simultaneous equations models (Ford and Jackson, 2010; Lopez and Lamy, 2012; Powdthavee *et al.*, 2013) is to show the instruments' indirect impact on other dependent variables. To explore the indirect impact of household savings and size on the debt service ratio and the indirect effect of assets and total debt repayment on household consumption in this study, we set our empirical model as follows:

$$logHC_i = \beta_0 + \beta_1 logDSR_i + \beta_2 logY_i \ + \beta_3 logLFA_i + \beta_4 logSIZE_i + \beta_j \sum\nolimits_{j=1}^{3} HCH_{ij} + \varepsilon_{1i}$$
(7)

$$logDSR_i = \alpha_0 + \alpha_1 logHC + \alpha_2 logY_i \ + \alpha_3 logTINS_i + \alpha_4 logAS_i + \alpha_j \sum\nolimits_{j=1}^{3} HCH_{ij} + \varepsilon_{2i}$$
(8)

Each IV's derivatives show their indirect effects on the dependent variable of the equation that excludes these variables. The instrument's indirect influence value is derived from the simultaneous equations of coefficients (β_x, α_x)in this study. In this model, the IVs of LFA and SIZE influence the debt service ratio only through its effect on household consumption. Therefore, the indirect effects of LFA and SIZE on the DSR through the HC are $\beta_3\alpha_1$ and $\beta_4\alpha_1$. However, the IVs of TINS and AS influence household consumption only through its effect on the debt service ratio. Thus, the indirect effects of TINS and AS on the HC through the DSR are $\beta_1 \alpha_3$ and $\beta_1 \alpha_4$.

4. Results and discussion

4.1 Empirical results

Table 1 reports the regression results of the ordinary least squares (OLS), two-stage least squares (2SLS) and robustness (VCE) approaches to the estimation of the household consumption and the debt service ratio from the simultaneous estimation of each equation. The first equation's independent variables are the debt service ratio, personal disposable income, liquid financial assets (savings), household size and household characteristics, whereas the dependent variable is the household consumption. The second equation's independent variables are the household consumption, personal disposable income, total debt repayment instalments, assets and household characteristics, whereas the dependent variable is the debt service ratio (DSR).

In the following, we test for endogeneity and overidentification and perform robustness tests on our models. First, the Hausman (1978) specification test is used to compare the OLS and IV models to identify the efficiency of the OLS and instrumented model estimation and specifically to determine the best linear unbiased estimate when the OLS and 2SLS are consistent and uncorrelated. If the Hausman chi-square test statistic is greater than the

Variables	LHC Model 1	LHC Model 2	Model 3	LDSR Model 4	Model 5
LDSR	−0.069***	−0.065***			
	(0.003)	(0.003)			
LHC			−0.110***	−0.096***	−0.096***
			(0.005)	(0.007)	(0.008)
LY	1.049***	1.049***	−0.806***	−0.817***	−0.817***
	(0.009)	(0.009)	(0.006)	(0.007)	(0.008)
LLFA	−0.211***	−0.211***			
	(0.003)	(0.003)			
LSIZE	0.004***	0.004***			
	(0.001)	(0.001)			
LTINS			0.948***	0.949***	0.949***
			(0.001)	(0.001)	(0.002)
LAS			0.009***	0.008**	0.008**
			(0.003)	(0.003)	(0.003)
GENDER	0.001	0.001	0.004***	0.004***	0.004***
	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
LOCATION	−0.015***	−0.015***	0.006***	0.007***	0.007***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
B40	−0.025***	−0.024***	0.046***	0.046***	0.046***
	(0.006)	(0.006)	(0.003)	(0.003)	(0.003)
M40	−0.014***	−0.014***	0.024***	0.025***	0.025***
	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)
Constant	0.231***	0.234***	−0.248***	−0.260***	−0.260***
	(0.034)	(0.034)	(0.018)	(0.018)	(0.021)
Endogeneity test	0.000***		0.0059***		
Overidentification test		0.0638**		0.0472***	0.0606**
Observations	4,730	4,730	4,730	4,730	4,730

Notes: Standard errors in parentheses. *** $p < 0.01$; **$p < 0.05$; *$p < 0.1$; Models 1 and 2: (DV–LHC), (OLS), (2SLS) Models 3, 4 and 5: (DV–LDSR), (OLS), (2SLS), (2SLS–VCE)

Table 1.
Simultaneous
equation estimation
of debt service ratio
and household
consumption

critical value or the significance level (p-value) is less than 0.05 (5%), the null hypothesis is rejected, indicating that the IV should be used. In contrast, if the Hausman chi-square test statistic is less than the critical value or the significance level (p-value) is greater than 0.05 (5%), the alternative hypothesis is rejected, and this indicates that the OLS estimator should be used. Based on the endogeneity test or Hausman test in Models 1 and 3, the probability values are 0.000 and 0.0059, respectively; hence, the test is significant at the 5% level, allowing us to reject the null hypothesis. Therefore, we can conclude that Models 2 and 4 provide more accurate results.

The next step is the Sargan (1958) test for overidentification. If the p-value is greater than 0.05, then the null hypothesis cannot be rejected, and our instruments are valid or our structural model is specified correctly. If the null hypothesis is rejected (the p-value is less than 0.05), this means that one or more of our tools is invalid or that our structural model specifies errors. The result for the overidentification test in Model 2 shows that the p-value is 0.0638; thus, we fail to reject the null hypothesis. In Model 4, the p-value for the overidentification test is 0.0472. As the test is significant at the 5% level, we can reject the null hypothesis. Putting these results together, we can conclude that Model 2 is valid and that our structural model is specified correctly but that Model 4 is invalid and our structural model specifies an error.

Either one or more of our instruments is invalid or our structural model specifies an error. One possibility is that the error terms in our structural model are heteroscedastic.

Further, we test for multicollinearity by using Variance inflation factor (VIF) (see Appendix). The VIFs are 3.15 and 4.15 for household consumption model and debt service model, respectively. These values indicate that multicollinearity is not a concern in our regressions because they are lower than 10 (Hair *et al.*, 1995). Multicollinearity test is conducted on Models 1 and 3 and it is not applied to 2SLS in Models 2 and 5 because VIF was used to detect the severity of multicollinearity in the OLS regression analysis and the structural coefficients in 2SLS are directly estimated from the second-stage (OLS) regressions. Additionally, the joint hypothesis testing can be represented by R^2 in the OLS context (Wooldridge, 2009); that cannot be done in the IV or 2SLS context. The VIF test is irrelevant in this case because the model is intended to find out how an independent variable being described by the other independent variables. In the IV estimator with correlation between x and μ, we can no longer decompose the change of y into two independent components sum of squared estimate of errors (SSE) and sum of squared residuals (SSR), and R^2 has no natural interpretation. Therefore, we can ignore R^2 in the IV or 2SLS context.

We modify Model 4 with the standard robustness error and obtain the Wooldridge score test overidentification restrictions. After the robustness test, the results show that the significance level (*p*-value) is greater than 0.05, which is 0.06. Therefore, this means that the null hypothesis is no longer rejected and indicates that the instruments are valid and not weak at the 5% significance level in Model 5.

Model 2 shows that household income and size positively affect household consumption, and this relationship is significant at the 1% level. In other words, when the income and size per household increase, the consumption increases by 1.049 and 0.004 per household, respectively. However, the debt service ratio and savings have a negative influence on household consumption, which implies that, when the debt service ratio and savings per household increase, the consumption decreases by 0.065 and 0.211 per household, respectively. Consequently, as implied by the SEM, household debt repayment instalment and assets have an indirect effect on household consumption through its effect on the debt service ratio.

Further, there are different effects of household characteristics, particularly income groups and location, on household consumption. Specifically, the B40 consumption is the lowest, at 0.210 (0.234–0.024), while the M40 consumption is in the middle, at 0.220 (0.234–0.014) and the highest consumption is among T20 with 0.234 per household. With regard to location, we find that the consumption is higher for urban households than for those in rural areas, with 0.234 compared with 0.219 (0.234–0.015). We do not find the household head's gender to have a significant different effect on household consumption.

Moreover, Model 5 indicate household consumption and personal disposable income have a negative impact on debt service ratio, and this relationship is significant at the 5% level. That is to say, when the consumption and personal disposable income per household increase, debt service ratio will decrease by 0.098 and 0.261 per household. Nevertheless, the total debt repayment instalment and assets positively and significantly influence on debt service ratio. When total debt repayment instalment and assets per household increase, this causes debt service ratio to increase by 0.363 and 0.033 per household, respectively. This finding implies that household savings and size have an indirect impact on the debt service ratio, which is through its effect on household consumption.

Additionally, there are different impacts of household characteristics on debt service ratio. Specifically, the B40 debt service ratio is the lowest, at -0.210 ($-0.260 + 0.046$), whereas the M40 debt service ratio is in the middle, at -0.235 ($-0.260 + 0.025$), and the

highest debt service ratio is among T20 with −0.260 per household. Regarding the household head's gender, we find that the debt service ratio is lower when the household head is female, with −0.256 (−0.260 + 0.004) compared household head is male with −0.260 per household. In reference to location, we find that the debt service ratio is higher for urban households than for those in rural areas, with −0.260 compared with −0.253 (−0.260 + 0.007).

Table 2 presents the indirect impact of the IVs from the household consumption and debt service ratio equations. The Table 2 presents the indirect influence of the instrument by utilising all the measurements of the household consumption and debt service ratio. The IVs under consideration are liquid financial assets (LFA), household size (SIZE), total debt repayment instalments (TINS) and household assets (AS).

dlogDSR and dlogLFA are changes in the natural log of the debt service ratio divided by the natural log of liquid financial assets (savings), and dlogDSR and dlogSIZE are changes in the natural log of the debt service ratio divided by the natural log of the household size to test the indirect effects of LFA and SIZE on the DSR through household consumption. Next, dlogHC and dlogTINS are changes in the natural log of household consumption divided by the natural log of total debt repayment instalments, and dlogHC and dlogAS are changes in the natural log of household consumption divided by the natural log of household assets to test the indirect influence of TINS and AS on the DSR through household consumption.

The IVs of LFA and SIZE have a direct influence on household consumption and then indirectly affect the debt service ratio. In other word, LFA and SIZE influence the debt service ratio only through its effect on household consumption. However, the IVs of TINS and AS directly affect the debt service ratio and then indirectly affect household consumption. That is to say, TINS and AS exert an impact on household consumption only through its effect on the debt service ratio.

The LFA has a positive indirect influence on the debt service ratio when all the measurements of household consumption are used. An increase of savings per household will indirectly cause an increase in the debt service ratio of 0.0203 per household. However, the household size has a negative indirect impact on the debt service ratio when all the measurements of household consumption are used. With an increase of size per household, the debt service ratio will decrease by 0.0004 per household.

Furthermore, the total debt repayment instalments and assets negatively influence the household consumption when all the measurements of the debt service ratio are used. An increase of the total debt repayment instalments and assets per household will indirectly affect the consumption, decreasing it by 0.06 and 0.0005 per household.

4.2 Discussion
The results of our household consumption equation show that the debt service ratio has a significant negative impact on household consumption. These results are similar to those of Mian and Sufi (2010), who found that the counties in the USA with the most significant

Variables	dlogDSR/dlogLFA	dlogDSR/dlogSIZE	dlogHC/dlogTINS	dlogHC/dlogAS
HC	0.02026	−0.00038	−	−
DSR	−	−	−0.06169	−0.00052

Table 2.
Indirect effect of instrument variables from household consumption and debt service ratio equations

increase in the debt service ratio from 2002 to 2006 experienced the largest decline in private consumption after the crisis. One possible explanation is that households that were highly leveraged were forced to consume less before the crisis as the borrowing conditions tightened. Another credible reason is that some households cut back on spending as a precaution against expectations of lower income and job prospects. Our results show that household consumption has a negative influence on the debt service ratio. Ogawa and Wan (2007) and Kim (2016) similarly reported that the debt–consumption nexus was based on Japanese household data and that the debt service ratio negatively affected household consumption mainly through borrowing constraints.

Besides that, households' personal savings have a negative significant effect on their consumption. This result is similar to that of Habeeb (2015), who used the empirical data of the American economy from 1960 to 2013 to determine the level of personal consumption expenditure under the condition of economic structure changes. He found a negative relationship between household consumption and personal savings and reasoned that people tend to invest in stocks rather than personal consumption.

Personal disposable income has a positive relationship with household consumption. Alirzayev (2010) and Rakhmanov (2017) studied household income's effect on household consumption from 1995 to 2008 and found a positive nexus between households' consumption and their income. Furthermore, Rakhmanov (2017) documented that households' consumption and income are positively related due to the increased demand for luxury goods when the household income increased from 2000 to 2015. However, we find that personal disposable income has a significant negative influence on the debt service ratio. Mian and Sufi (2011) stated that the experience of the global financial crisis suggests that high household debt can be a source of financial vulnerability and can lead to prolonged recessions. Broader cross-country studies have also shown that rising household debt predicts lower or reduced personal disposable income and financial crises in the medium term (Mian *et al.*, 2017; Jorda *et al.*, 2016).

Consistent with previous research, we document a positive relationship between household size and household consumption. Based on Consumer Expenditure Survey data from 1973, Espenshade *et al.* (1983) showed that growth in household size was consistently associated with a rising share of total consumption for necessities such as food and clothing. As the household size increases, the housing conditions become more crowded and directly cause the household consumption to increase.

We find that assets have a positive relationship with the debt service ratio. According to Dynan and Kohn (2007), an increase in the actual asset holdings is associated with an increase in debt and leads directly to an increase in debt servicing ratios, indirectly making households more vulnerable to asset price shocks. Furthermore, the total debt repayment instalments have a positive influence on the debt service ratio. The housing boom has also played a big role in the rapid buildup of household indebtedness. The high demand from rising incomes and population, combined with a relatively inelastic supply, have pushed up house prices, but expectations of future capital gains have encouraged the investment demand for housing. Thus, the relatively easy connection between the long-run rise in house prices and mortgage finance has led to high levels of accumulation of residential mortgage debt. Meng *et al.* (2013) examined the determinants of household indebtedness in Australia and found that the housing price, GDP and population exert a positive impact on household borrowing.

In this study, we also focus on the different impacts of household characteristics on household consumption and the debt service ratio. Across income groups, we show that the B40 consumption was the lowest, while the M40 consumption was in the middle and the

highest consumption was among the T20 group. According to Department of Statistics Malaysia (2020), the T20 and M40 groups are more flexible in making their consumption pattern decisions than the B40 group, who have to allocate spending to meet basic needs because of income constraints. Therefore, the debt service ratio for the M40 and T20 groups was higher than that for the B40 group because a higher income leads to more spending or consumption, especially on luxury goods.

Besides, the consumption and debt service ratio among households living in urban areas is higher than that of those living in rural areas. This is consistent with the fact that Department of Statistics Malaysia (2020) the urban population tends to increase over time. Therefore, urban areas have a higher proportion of household consumption than rural areas. The higher consumption in urban areas will cause a higher debt service ratio than in rural areas. In the case of our study, household consumption in urban areas grew by 3.7% annually from RM4,402 to RM4,916. Meanwhile, in rural areas, the annual increase between 2016 and 2019 was from RM2,725 to RM3,038.

Regarding the household head's gender, we find that the debt service ratio is higher when the household head is male. Flores and Vieira (2014) examined the determinants of indebtedness – the influence of behavioural and demographic factors – and stated the relationship between the gender variables of the population and indebtedness. Their findings showed that household indebtedness is higher for men than for women.

We further test the indirect effect of household savings and size on the debt service ratio as well as the indirect effect of total debt repayment and assets on household consumption. We find that savings have a positive indirect influence on the debt service ratio when all the measurements of household consumption are used. When households' savings increase, they will have more money to purchase goods and services. Zimunya and Raboloko (2015) examined the effects of consumption on household debt in Botswana and found that it positively affected the household debt levels, as expected by traditional theories.

However, the household size has a negative indirect influence on the debt service ratio when all the measurements of household consumption are used. Kiran and Dhawan (2015) studied the effect of household size on industrial workers' consumption and their results indicated that an increase in the household size will lead directly to reduced savings and increased spending because the spending is to satisfy the additional household members' consumption needs, especially for food, a car and housing. Kovacs et al. (2018) used data at the household level and stated that households that were highly leveraged showed a sharper reduction in their consumption following the crisis than average households, especially for younger households.

Furthermore, the total debt repayment instalments and assets negatively and indirectly influence household consumption when all the measurements of the debt service ratio are used. Ji et al. (2019) investigated the nexus between household indebtedness and consumption in The Netherlands during the period 2006–2015. They found that the financial crisis had a stronger negative impact on consumption with a high household debt service ratio. In addition, Kukk (2016) found that households with a high level of indebtedness, especially a high debt service ratio, will reduce their consumption more than others during a crisis.

Besides, Lombardi et al. (2017) examined the short- and long-term impacts of rising household debt on output and consumption growth. They used debt data collected from national sources to measure bank loans to households for purchasing houses and other assets, such as vehicles. They found that increased asset purchases lead to a higher household debt service ratio and indirectly affect households by reducing their consumption in the short run.

5. Conclusions and recommendation

In conclusion, our results show that there is a negative relationship between household consumption and household indebtedness. We found that the debt service ratio and savings are negatively related to consumption, while income and household size are positively related to it. Consistent with our hypotheses, first, income and consumption have a negative relationship with indebtedness. Second, household assets and total debt repayment are positively related to indebtedness. Besides, there are different effects of the gender of the household head, rural and urban areas and income groups on consumption and indebtedness. In addition, we found that household savings and size have an indirect impact on the debt service ratio and that assets and total debt repayment instalments have an indirect effect on household consumption.

Household consumption and the debt service ratio are essential elements of the economic growth in a country. This study contributes to the empirical literature by establishing a microeconomic perspective of consumption and an indebtedness model focusing on the differences in household characteristics in explaining consumption and indebtedness. Based on our findings, the government should adopt several programmes to increase the awareness of household financial and debt management, especially for those in the low-income group.

Future research can investigate further the relationship between households' indebtedness and their consumption and the roles of household characteristics by considering other factors, such as the loan interest rate. The primary limitation of this study is the availability of data for a more extended period. Using a longer period or longitudinal data would provide more clues to the nexus between households' indebtedness and their consumption and the roles of household characteristics.

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Appendix. Result of variance inflation factor (VIF) test

Vif Variable	VIF	1/VIF
B40	8.40	0.119017
LY	6.50	0.153841
M40	3.80	0.263094
LLFA	2.30	0.434181
LDSR	1.09	0.917446
LOCATION	1.06	0.941377
LSIZE	1.06	0.944289
GENDER	1.02	0.981882
MEAN VIF	3.15	

Table A1.
VIF test for household consumption model

Vif Variable	VIF	1/VIF
LY	9.81	0.101920
B40	8.36	0.119621
LHC	5.77	0.173282
M40	3.77	0.265557
LTINS	2.06	0.484789
LAS	1.35	0.740699
LOCATION	1.06	0.940542
GENDER	1.01	0.991989
MEAN VIF	4.15	

Table A2.
VIF test for debt service ratio model

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