CHAPTER 4

FINDINGS AND DISCUSSION

4.1 Introduction

This chapter discusses the findings for all the estimated models to answer each objective proposed in Chapter 1. The first objective is to examine the relationship between household debt and economic growth, discussed in subsection 4.2.2. The second objective is to investigate the role of institutional quality in the link between household debt and growth, discussed in subsection 4.2.3. Section 4.3 elaborates the factors determining household debt, while the third objective is to examine the role of financial development as a determinant of household debt is presented in subsection 4.3.3. Finally, section 4.4 provides a discussion on the fourth objective, which is to explore the role of household debt as a predictive indicator in the EWS model for systemic banking crises. Moreover, this chapter includes the descriptive statistics for the sample data used for each objective, regression output, and a discussion on the empirical evidence in each subsection.

4.2 The Effect of Household Debt on Economic Growth

This section discusses the first objective of this study, which is to examine the effect of household debt on economic growth and the effect of institutional quality in the debt-growth nexus, addressed in subsections 4.2.2 and 4.2.3, respectively. In addition, the study aims at investigating the interaction term between household debt and institutional quality in the debt-growth model, explained in subsection 4.2.4. The empirical results are analysed using a bias corrected Least Square Dummy Variables (LSDVC) for a panel data of 43

countries between 1980 and 2018. A preliminary analysis of the variables is discussed in subsection 4.2.1. Lastly, subsection 4.2.5 demonstrates further analysis for the robustness test.

4.2.1 Descriptive Statistics for the Economic Growth Model

As a preliminary analysis, Table 4.1 provides the summary statistics for the control variables, namely real GDP per capita growth (GDPPCG), gross capital formation (GCF), population growth (POPG), human capital (HC), trade openness (TO), inflation (INF), household debt (HD), and institutional quality (INS). These statistics cover a panel data of 43 countries over the period of 1980 to 2018.

Table 4.1: Descriptive Statistics for the Economic Growth Model

Variable	Mean	Std.Dev.	Min	Max
GDPPCG	2.317	2.058	-4.504	10.884
GCF	24.248	4.983	11.828	47.541
POPG	0.826	0.717	-0.432	3.597
HC	76.086	4.88	54.703	84.395
TO	80.942	72.338	12.476	425.158
INF	7.532	27.488	-3.634	446.836
HD	44.822	28.976	0.275	130.3
INS	25.141	4.114	15.878	32.33

Notes: GDPPCG = Gross domestic product per capita growth, GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, and INS = institutional quality.

The real GDP growth per capita is 2.32% on average, with minimum and maximum values of −4.5% (Greece) and 10.88% (China), respectively, for the sample countries. The gross capital formation to GDP ratio is 24.25% on average, and its minimum value is 11.83% (Greece) and maximum value is 47.54% (China). The average population growth is 0.83% with minimum and maximum values of −0.43% (Russian Federation) and 3.6%

(Singapore), respectively. The life expectancy rate representing human capital has an overall mean of 76 years and varies between the minimum of 54 years (South Africa) and the maximum of 84 years (Hong Kong). The trade openness to GDP ratio has an average value of 80.94% with a wide variation between the minimum and maximum values with 12.48% (US) and 425.16% (Hong Kong), respectively. Inflation has an overall mean of only 7.53% with the minimum point of −3.63% (Hong Kong) and maximum point of 446.84% (Argentina)[12]. The overall average of household debt to GDP ratio is 44.82% with a minimum value of 0.28% (Turkey) and a maximum value of 130.3% (Denmark). Institutional quality has an overall mean of 25.14 and ranges from the lowest to the highest standard of quality from 15.88 (Mexico) to 32.33 (Norway).

Table 4.2 presents the correlation matrix for all variables. Notably, some of the variables are consistent with the theoretical predictions. For instance, gross capital formation is positively correlated and statistically significant with economic growth. Meanwhile, human capital and household debt each has a negative correlation and is statistically significant with the real growth of GDP per capita. As displayed in the table, human capital, inflation, and institutional quality are inconsistent with the underlying assumptions. Though some variables show opposite correlations to theoretical predictions, these do not mirror the real causal relationship. Among the determinants of the economic growth model, gross capital formation shows the highest correlation with real GDP per capita growth with 0.526.

[12] Starting from the Rodrigazo (name of economic policy) in 1975, inflation accelerated sharply reaching an average of more than 300% per year from 1975 to 1991, increasing prices by 20 billion times, leading to several redenomination of the Argentine currency and caused stagnation to Argentina.

Table 4.2: Correlation Matrix for the Economic Growth Model

Variables	GDPPCG	GCF	POPG	HC	TO	INF	HD	INS
GDPPCG	1							
GCF	0.526	1						
	(0.000)							
POPG	0.053	0.114	1					
	(0.367)	(0.055)						
LIR	-0.373	-0.152	-0.17	1				
	(0.000)	(0.01)	(0.003)					
TO	0.061	0.022	0.176	0.312	1			
	(0.302)	(0.707	(0.003)	(0.000)				
INF	0.075	-0.085	0.094	-0.228	-0.122	1		
	(0.201	(0.154)	(0.108)	(0.000)	(0.039)			
HD	-0.305	-0.104	-0.103	0.647	0.182	-0.243	1	
	(0.000)	(0.081)	(0.078)	(0.000)	(0.002	(0.000)		
INS	-0.155	-0.096	-0.179	0.481	0.074	-0.191	0.546	1
	(0.012)	(0.122)	(0.004)	(0.000)	(0.235)	(0.002)	(0.00)	

Notes: GDPPCG = Gross domestic product per capita growth, GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, and INS = institutional quality. The statistical level of significance is in parentheses ().

Table 4.3 displays the variance inflation factor (VIF) values of the explanatory variables. The VIF values do not exceed the cut-off point of 10 suggested by Hair et al. (1995) and Gujarati and Porter (2003). The tolerance mean value is 1.408, indicating no serious collinearity problems.

Table 4.3: Variance Inflation Factor for RO1 & RO2

	VIF	1/VIF
GCF	1.07	0.935
POPG	1.126	0.888
HC	1.921	0.52
TO	1.173	0.853
INF	1.111	0.9
HD	1.916	0.522
INS	1.535	0.652
Mean VIF	1.408	.

Notes: GDPPCG = Gross domestic product per capita growth, GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, and INS = institutional quality.

4.2.2 **RO1: Regression Analysis for the Household Debt-Growth Nexus**

The analysis begins by looking at the effect of household debt on growth model. This study aims to gain insight into whether household debt (HD) might have a negative impact on economic growth using LSDVC[13] (AH), LSDVC (AB), and LSDVC (BB) together with a level of accuracy or precision of 3 and customised the standard errors using bootstrapped standard errors of 50 replications. Moreover, the effect of household debt on growth has also been estimated in the models with a banking crises (CRISIS) dummy variable following Cecchetti et al. (2011) to provide robust evidence and avoid omitted variables.

Table 4.4 provides the main result for the study using LSDVC (AH), LSDVC (AB), and LSDVC (BB) estimations. The analyses begin with a baseline regression analysis, which investigates the linear regression of household debt in the growth model presented in models 1a to 1f. The result shows that the lagged dependent variable is negative and significant at the 5% confidence level, suggesting that the growth of real GDP is persistent. The coefficients of the household debt to GDP variable are −0.032, −0.034, −0.036, −0.028, −0.029, and −0.031, statistically significant at the 1% with respect to columns 1a to 1f, respectively. The empirical evidence proves that an increase in household debt has an adverse effect on growth by 0.028% to 0.036%.

[13] A bias-corrected Least Square Dummy Variables (LSDVC) estimator proposed by Bruno (2005b) based on modifications by Anderson and Hsiao (AH, 1981), Arellano and Bond (AB, 1991), and Blundell and Bond (BB, 1998)

Table 4.4: LSDVC Analysis – Household Debt and Economic Growth

Independent Variables	LSDVC			LSDVC (with Crisis Dummy)		
	AH	AB	BB	AH	AB	BB
	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)
HD	-0.032***	-0.034***	-0.036***	-0.028***	-0.029***	-0.031***
	(0.011)	(0.010)	(0.011)	(0.010)	(0.010)	(0.011)
L.GDPPCG	-0.193***	-0.205***	-0.154**	-0.158**	-0.167***	-0.115*
	(0.066)	(0.064)	(0.070)	(0.064)	(0.063)	(0.068)
GCF	0.123***	0.126***	0.119***	0.116***	0.119***	0.110***
	(0.040)	(0.037)	(0.042)	(0.039)	(0.037)	(0.041)
POPG	-0.575**	-0.575**	-0.555*	-0.505*	-0.507*	-0.483*
	(0.289)	(0.267)	(0.296)	(0.278)	(0.259)	(0.286)
HC	-0.232***	-0.225***	-0.216***	-0.234***	-0.228***	-0.219***
	(0.070)	(0.064)	(0.073)	(0.068)	(0.063)	(0.072)
TO	0.024***	0.024***	0.024***	0.022***	0.022***	0.023***
	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)
INF	-0.038*	-0.038*	-0.038*	-0.042**	-0.041**	-0.042**
	(0.021)	(0.020)	(0.022)	(0.021)	(0.019)	(0.021)
CRISIS				-4.074***	-4.023***	-4.246***
				(1.362)	(1.278)	(1.420)
Obs	245	245	245	245	245	245
N	43	43	43	43	43	43

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, and CRISIS = Systemic banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

The outcome is supported with many studies, i.e., Cecchetti et al. (2011), Gómez-Puig and Sosvilla-Rivero (2017), Mian and Sufi (2018), and Alter et al. (2018). The role of household debt in explaining economic growth can be traced to the consumption life cycle model. Debt bridges the budget constraint faced by households in financing their consumption and asset accumulation. Consequently, higher household consumption spurs aggregate output and upsurges the countries' growth. Debt through deficit financing can boost aggregate demand and output, at least in the short run (Cecchetti et al., 2011). In the long run, households realise the overburden of debt to income caused by interest rate shock or income shock, leading to low abilities to repay loan. To compensate the consequence, they start to cut their expenditure, which eventually impedes economic growth. The rising level of debt overburdens households, resulting in detrimental effects on growth (Nofsinger, 2012). Furthermore, Mian and Sufi (2010), Mian et al. (2013), and Dynan (2012) have shown that the sluggish growth in consumption in the years following the 2007–2009 recession can be attributed to the levels of outstanding debt in households' balance sheets. Mian and Sufi (2009) discovered that US counties with rapidly increasing household debt had prolonged economic downturn as compared to counties with lower household debt. Hence, the empirical outcome of this study confirms past evidence on the negative effect of household debt on growth.

Turning to the control variables, the coefficients of capital stock are significant in the range of 0.11 to 0.126 at the 1% confidence level in all regressions 1a to 1f. Capital stock has a positive impact on growth, suggesting that a 1% increase in capital stock stimulates growth by 0.11% to 0.126%. This finding is consistent with Ugochukwu and Chinyere (2013), Cecchetti et al. (2011), and Gómez-Puig and Sosvilla-Rivero (2017) which posited

that capital is an investment for wealth creation, thus stimulating economic growth. Investment is also reflected in labour-augmenting technological changes, which are exogenous in defining the equilibrium growth of per capita output (Solow, 1956; Swan, 1956). Thus, investment has a positive relationship with economic growth.

The coefficients of population growth are significant at 5% and 10% confidence level between −0.483 and −0.575. Population growth has a negative impact on economic growth, suggesting that a 1% increase in population growth reduces the economic performance of investigated countries by −0.483% to −0.575%. The result is supported by the previous studies of Dao (2012), Mankiw et al. (1992), and Woo and Kumar (2015). Dao (2012) argued that a growing population will lead to a lower standard of living because of comparatively slower technical progress in the agricultural sector and limited supply of land. Likewise, a rapid increase in the population requires investment to supply the needs of the people but it does not improve the living conditions. Also, the Malthusian Theory of population argues that the pressure of an increasing population on the food supply will destroy the wellbeing and cause life misery. Thus, population growth negatively affects economic growth.

Turning to other control variables, human capital is negatively correlated with growth in the investigated countries. Its significantly influence on growth with coefficients standing within the range of −0.216 to −0.234. This finding indicates that a 1% increase in human capital lessens economic growth by 0.216% to 0.234%. This result contradicts the finding of Gómez-Puig and Sosvilla-Rivero (2017) that human capital has a positive effect on growth. However, this study's result is consistent with the empirical evidence documented by Barro (2003), Cervellati and Sunde (2011), and Kunze (2014), which

proves that human capital proxied by life expectancy reduces growth and explains that improvements in life expectancy, portraying an ageing population associated with high health problems, lead to low productivity and reduce the growth of a country.

Trade openness is positively correlated with economic growth. The magnitudes of trade openness are 0.022 to 0.024 at the 1% confidence level in columns 1a to 1f, respectively. The result indicates that a 1% increase in trade openness improves economic performance by 0.022% to 0.024%. This results is in line with the findings of Seghezza and Baldwin (2008) and Bahadir and Valev (2020). Krueger (1998) asserted that theoretically, trade openness has a positive influence on growth. Trade openness affects economic growth, particularly for an open economy. Open economies precede trade openness arising from international market activities, such as increases in exports and imports. Seghezza and Baldwin (2008) posited that trade openness boosts labour productivity through knowledge transfer. In addition, trade openness facilitates participating countries in acquiring advanced technologies from leading nations. Hence, output and employment are maximised by international trade among different participating countries (Salvatore, 2010). In particular, increased consumption correlates with increased household borrowings. Thus, in an open economy, there are exportation and importation of goods between countries. Hence, the findings suggest that trade openness facilitates economic growth. Furthermore, investment growth is encouraged by trade openness (Yanikkaya, 2003; Alam & Sumon, 2019; Raghutla, 2020). Hence, the positive effect of trade openness on growth has been empirically proven.

Next, inflation is negative and statistically significant with the coefficients ranging from −0.038 to −0.042, suggesting that a 1% increase in inflation reduces economic growth

in the investigated countries by 0.038% to 0.042%. The finding is consistent with Krueger (1998), Gokal and Hanif (2004), and Barro (2013). Inflation has also been debated as a crucial macroeconomic indicator of economic growth. Rising inflation means an increased opportunity cost of holding cash, thereby decreasing the demand for money (Sidrauski, 1967). Moreover, it is a cost on firms to allocate more resources to finance inflating prices (Gokal & Hanif, 2004). Inflation causes uncertainty about the future profitability of investment projects. Firms and households tend to perform poorly following the adoption of conservative investment strategies (Barro, 2013). Inefficient resource allocation also squeezes profitable investments and causes an economic slowdown (Fisher, 1993). Barro (2013) stated that an increase in the average inflation causes a decrease in the annual growth rate of real GDP per capita. Therefore, the result shows that inflation has a negative relationship with growth.

The pieces of empirical evidence presented in Table 4.4 are robust and consistent with or without the crisis dummy variable, signifying that household debt has a negative effect on long-run output per capita growth for the investigated countries. Hence, appropriate policy formulation must be observed and taken into careful consideration to ease the effect of household debt on growth.

4.2.3 **RO2: Institutional Quality, Household Debt, and Economic Growth**

This section discusses the extended model by incorporating the effect of household debt together with institutional quality in the growth model. The empirical model is presented in Table 4.5 using LSDVC (AH), (AB), and (BB) in columns 2a to 2c, respectively, and with the CRISIS dummy in columns 2d to 2f.

The results show that institutional quality is positive and statistically significant in explaining the growth rate of GDP per capita. The elasticity values of institutional quality with regard to economic growth are 0.028and 0.029 based on models 2b and 2c, implying that a 1-point increase in institutional quality is associated with an upsurge of the economic growth by at least 0.028% and 0.029%. These findings are consistent with the studies on panel data by Hall and Jones (1999), Acemoglu et al. (2001), Klapper and Love (2004), Law et al. (2017), and Bahadir and Valev (2020), which concluded that institutional quality leads to better operating performance and sustains long-term growth. When the crisis dummy is included, the coefficients of institutional quality improve to 0.074 and 0.077 at the 1% confidence level.

The explanation that links institutional quality and the debt-growth model can be accentuated as high institutional quality provides a secure environment and better policy formulation that leads to economic development (Kim & Loayza, 2017). Better institutional qualities such as good governance and regulations strengthen the role of financial institutions and act as a buffer to withstand the risks inherent in contractionary monetary policy, such as financial liberalisation, deregulation, and innovation.

Table 4.5: LSDVC Analysis - Institutional Quality and Economic Growth

Independent variables	LSDVC			LSDVC (with Crisis Dummy)		
	AH	AB	BB	AH	AB	BB
	(2a)	(2b)	(2c)	(2d)	(2e)	(2f)
HD	-0.042***	-0.043***	-0.046***	-0.033***	-0.035***	-0.036***
	(0.011)	(0.01)	(0.011)	(0.01)	(0.01)	(0.011)
INS	0.027	0.028*	0.029*	0.074***	0.074***	0.077***
	(0.017)	(0.016)	(0.016)	(0.021)	(0.02)	(0.022)
L.GDPPCG	-0.231***	-0.239***	-0.203***	-0.205***	-0.215***	-0.174**
	(0.067)	(0.065)	(0.069)	(0.065)	(0.063)	(0.068)
GCF	0.217***	0.219***	0.219***	0.227***	0.229***	0.227***
	(0.045)	(0.043)	(0.046)	(0.044)	(0.042)	(0.046)
POPG	-1.068***	-1.056***	-1.051***	-0.992***	-0.981***	-0.973***
	(0.326)	(0.307)	(0.326)	(0.309)	(0.291)	(0.317)
HC	-0.074	-0.066	-0.054	-0.224**	-0.215**	-0.211**
	(0.091)	(0.085)	(0.093)	(0.098)	(0.092)	(0.104)
TO	0.026***	0.025***	0.026***	0.029***	0.029***	0.030***
	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)
INF	-0.022	-0.021	-0.021	-0.028	-0.027	-0.028
	(0.019)	(0.018)	(0.02)	(0.018)	(0.017)	(0.019)
CRISIS				-3.922***	-3.810***	-4.035***
				(1.482)	(1.408)	(1.542)
Obs	228	228	228	228	228	228
N	43	43	43	43	43	43

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, and CRISIS = Systemic banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

At the same time, households' optimism about future income leads to increased demand for loans as they feel secure with the country's stability. As such, better institutional qualities play an important role in strengthening the economic performance of countries. The role of institutional quality becomes strengthened during the crises in order to ensure the sustainability of economic growth. During the crises, the government can regulate better policy such as offer temporary stimulus package, support to households through the social safety net, assistance to the financial sector and support for household debt restructuring (IMF, 2012). Bluhm et al. (2020) had confirmed empirically that there is positive institutional change occurs during the economic slumps, signifying that the institutional quality reformed to be better as a consequence of the pressure during the crises. This explains the reason why the coefficient of institutional quality is higher when the crises dummy is included.

The coefficients of household debt are significantly negative (at 1% confidence level) in influencing the growth of GDP per capita with a range of −0.033 to −0.046 in all specifications of 2a to 2f. The results imply that a 1% increase in household debt is associated with a reduction in the economic growth by at least 0.03%. For the control variables, the coefficients of gross capital formation are robust at 0.22 to 0.23 and statically significant in explaining economic growth. The positive coefficients of gross capital formation indicate that a 1% increase in gross capital formation stimulates economic growth by 0.22% to 0.23%. Meanwhile, the coefficients of population growth are between −1 and −1.068 and statistically negative in all columns 2a to 2f. The negative values indicate that a 1% increase in population growth slows the economic growth by at least 1% to 1.068%. The coefficients of trade openness are positive and significant, taking the values

of 0.025 to 0.03 in columns 2a to 2f. The findings are robust, suggesting that a 1% increase in trade openness improves the economic growth by 0.025% to 0.03%. Human capital is statistically negative in the models with the crisis dummy (2d to 2f) with the coefficients of −0.224, −0.215, and −0.211. Meanwhile, inflation is negatively correlated with economic growth but statistically insignificant.

Additionally, the CRISIS dummy is negative and statistically significant at the 1% confidence level for all regression analyses in columns 2d to 2f. Here, the coefficients of institutional quality become larger from 0.029 to 0.077 (for BB). The results indicate the crucial role of institutional quality in enhancing the economic growth during crises. Thus, there is a need to further analyse the role of institutional quality as a conditional factor in the household debt-growth nexus.

The pieces of empirical evidence presented in Table 4.5 are consistent and robust, signifying that household debt has a negative relationship with growth in the investigated countries. Indeed, the findings suggest that institutional quality has a robust and significant direct relationship with growth. Hence, the appropriate policy formulation must be observed and taken into careful consideration to ease the effect of household debt on growth.

4.2.4 **Interaction between Household Debt and Institutional Quality**

The study extends the model by incorporating the effect of the interaction between household debt and institutional quality in the growth model. The empirical model is presented in Table 4.6 using LSDVC (AH), (AB), and (BB) in columns 3a to 3c, respectively, and the model is regressed by incorporating the CRISIS dummy in columns 3d to 3f. As shown in the table, the estimated coefficients of lagged real growth of GDP per capita are significantly negative (at 1% confidence level as shown in column 3d to 3f), suggesting that the real growth of GDP per capita is persistent and LSDVC is suitable for this dynamic panel data.

The interaction model is used to investigate the role of institutional quality in the relationship between household debt and economic growth. Empirical results show that institutional quality has a robust and significant indirect relationship with growth via its effect on household debt. In the interaction model's specification (models 3a–3f), household debt's direct relationship with economic growth is consistently negative and significant with coefficient values of −0.148, −0.150, −0.154, −0.136, −0.138, and −0.140. However, institutional quality has an insignificant effect on growth. Interestingly, when institutional quality interacts with household debt, as shown in Table 4.6, the coefficient of the interaction term HD*INS becomes positive with 0.004 and statistically significant for all LSDVC estimators. The results are in line with IMF (2017), which suggests that institutional factors play a mediating role in the relationship between rising household debt and economic activity.

Table 4.6: LSDVC Analysis – Interaction Term

Independent Variables	LSDVC			LSDVC (with Crisis Dummy)		
	AH	AB	BB	AH	AB	BB
	(3a)	(3b)	(3c)	(3d)	(3e)	(3f)
HD	-0.148**	-0.150***	-0.154**	-0.136**	-0.138**	-0.140**
	(0.059)	(0.056)	(0.06)	(0.057)	(0.055)	(0.058)
INS	-0.118	-0.119	-0.12	-0.1	-0.1	-0.098
	(0.1)	(0.095)	(0.103)	(0.096)	(0.093)	(0.099)
HD*INS	0.004*	0.004**	0.004*	0.004*	0.004*	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
L.GDPPCG	-0.241***	-0.248***	-0.211***	-0.203***	-0.206***	-0.169**
	(0.065)	(0.063)	(0.067)	(0.066)	(0.065)	(0.068)
GCF	0.196***	0.197***	0.197***	0.186***	0.186***	0.184***
	(0.043)	(0.041)	(0.044)	(0.043)	(0.041)	(0.044)
POPG	-1.142***	-1.136***	-1.128***	-1.048***	-1.044***	-1.030***
	(0.35)	(0.337)	(0.359)	(0.343)	(0.33)	(0.349)
HC	-0.066	-0.061	-0.048	-0.102	-0.097	-0.088
	(0.09)	(0.087)	(0.095)	(0.092)	(0.089)	(0.097)
TO	0.024***	0.024***	0.025***	0.024***	0.024***	0.024***
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
INF	-0.03	-0.03	-0.029	-0.035*	-0.034*	-0.035*
	(0.019)	(0.019)	(0.02)	(0.019)	(0.019)	(0.02)
CRISIS				-3.699**	-3.690***	-3.849**
				(1.463)	(1.415)	(1.508)
Obs	228	228	228	228	228	228
N	43	43	43	43	43	43
Marginal Effect						
Mean	-0.047***	-0.048***	-0.050***	-0.041***	-0.041***	-0.043***
Min	-0.084***	-0.086***	-0.088***	-0.076***	-0.077***	-0.079***
Max	-0.018	-0.018	-0.02	-0.013	-0.014	-0.015

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

The next step is to calculate the marginal effects. The coefficients of the first conditional derivatives, as shown in Table 4.6, are derived from the LSDVC estimation based on Equation 3.17. The values of the marginal effects of HD*INS are calculated from the interaction term in Equations 4.1 to 4.6. Whether or not the value of the marginal effects is significant, it is tested using *t*-tests and standard errors calculated using a variance matrix as suggested by Brambor et al. (2006). The marginal effect calculations for the interaction term are as follows:

$$\text{Model 3a: } \frac{\partial GDPPCG}{\partial HD} = -0.148 + 0.004INS \quad (4.1)$$

$$\text{Model 3b: } \frac{\partial GDPPCG}{\partial HD} = -0.150 + 0.004INS \quad (4.2)$$

$$\text{Model 3c: } \frac{\partial GDPPCG}{\partial HD} = -0.154 + 0.004INS \quad (4.3)$$

$$\text{Model 3d: } \frac{\partial GDPPCG}{\partial HD} = -0.136 + 0.004INS \quad (4.4)$$

$$\text{Model 3e: } \frac{\partial GDPPCG}{\partial HD} = -0.138 + 0.004INS \quad (4.5)$$

$$\text{Model 3f: } \frac{\partial GDPPCG}{\partial HD} = -0.140 + 0.004INS \quad (4.6)$$

The marginal effects show that household debt is significantly negative at mean and minimum levels of institutional quality and but insignificant at the maximum level. The results show that the marginal effects of the interaction between household debt and institutional quality remain negative at the mean and maximum points, demonstrating a detrimental effect on growth. The values of marginal effect of HD*INS are significant ranging in between -0.041 and −0.050, using standard errors, as suggested by Brambor et al. (2006). Each additional percentage point in household debt causes a reduction in growth

by 0.047%, 0.048%, 0.050%, 0.041%, 0.041%, and 0.043%, respectively. The adverse effect of household debt on growth is lessened by the role of institutional quality. The marginal effects of HD*INS based on the lowest point of institutional quality are statistically significant between −0.076 and −0.088 for models 3a to 3f. At the minimum point, while holding the institutional quality constant, a 1% increase in household debt diminishes growth by 0.076% to 0.088%. In contrast, the role of institutional quality in the relationship between household debt and economic growth is insignificant at the highest point. This finding implies that lower institutional quality has a mediating effect by increasing the effect of higher household debt accumulation on reducing economic growth.

The outcome is in line with Bahadir and Valev (2020), which posited that the effect is stronger in countries with weak institutions where the proportion of consumer credit to the total household credit is greater. Another supporting evidence to these findings which explain that weak institutions may impede growth through the role of financial institutions is by Jha (2019), which proved that the financial liberalisation index is positively correlated with corruption. Furthermore, Blackburn and Forgues-Puccio (2010) found that high corruption causes financial liberalisation to become more attractive but may or may not increase economic development. Thus, it is reasonable to assume that financial liberalisation in a low institutional quality setting can cause a downside risk to economic expansion. Indeed, the slowdown in economic growth is caused by weak political and economic institutions (Acemoglu et al., 2003). This in turn causes a weak macro-economy (Demirgüç-Kunt & Detragiache, 1998). The intuition behind these pieces of empirical evidence is that lower levels of institutional quality encourage household debt to slacken economic growth. The consequence of income shocks may cause repayment problems

among borrowers, leading to default. Low institutional quality such as government instability, high corruption, and too many lax regulations may result in an inability to cope with financial market instability. This scenario will subsequently influence the negative effect of household debt on growth. However, the effect of household debt can be managed with strict regulations in nations with better institutional quality. Hence, this empirical result accentuates the importance of maintaining and improving institutional quality.

Regarding the effects of the control variables, gross capital formation is positive and has a significant influence on growth with coefficients of 0.184 to 0.197. The economic interpretation of these coefficients is that a 1% increase in gross capital formation surges the growth rates by about 0.184% to 0.197%. The coefficients of population growth are statistically significant at −1.142, −1.136, −1.128, −1.048, −1.044, and −1.030. A 1% increase in the population growth leads to a decrease in the real GDP growth by about 1.03% to 1.142%. Aside from this, the coefficients of trade openness are also significant, 0.024 to 0.025 which consistent with the baseline model. This result means a 1% increase in trade openness raises the real GDP growth by 0.024% to 0.025%. The coefficients of inflation are statistically significant with values of −0.034 and −0.035. An increase in inflation by 1% lowers the output per capita growth by 0.034% and 0.035%. The coefficients of human capital are statistically insignificant.

For the robustness check, the findings in columns 3d to 3f are regressed with the CRISIS dummy and presented in Table 4.6. The coefficient of the interaction term HD*INS is 0.004, robust and postively significant. The marginal effects of HD*INS are statistically significant at the 1% confidence level with mean values range between −0.041 and −0.05 and minimum values between −0.076 and −0.086. The magnitudes of other control

variables are consistent with the theoretical assumption. The coefficients of gross capital formation and trade openness are positively significant. In contrast, the effect of population growth is negatively significant in influencing the real GDP growth.

Figure 4.1 shows the marginal effect of a one unit increase in HD*INS on economic growth based on each country's INS value in year 2008 in which the global financial crisis happened. The effect of household debt on growth remains negative and are statistically significant but differs according to institutional quality values. For example, the institutional quality in the US was at 24.9 in 2008, which was above the average statistic and had a medium effect in controlling the influence of household debt. In comparison, the household debt of countries with lower INS values such as Thailand and South Africa (17.54 and 19.13) can have a greater negative effect on growth. Meanwhile, Finland had the lowest marginal effect of HD*INS on growth with INS standing at 31 and was not affected by the 2008 crisis[14]. Thus, the results imply that countries with depraved institutional quality increase the negative effect of household debt on growth.

[14] The result in Table 4.6 indicates the effect of institutional quality at the maximum point (32.3) is insignificant. Correspondingly, this study found that the negative effect of household debt on growth subsides at higher levels of institutional quality, albeit at the maximum level (31 and above) it then becomes meaningless.

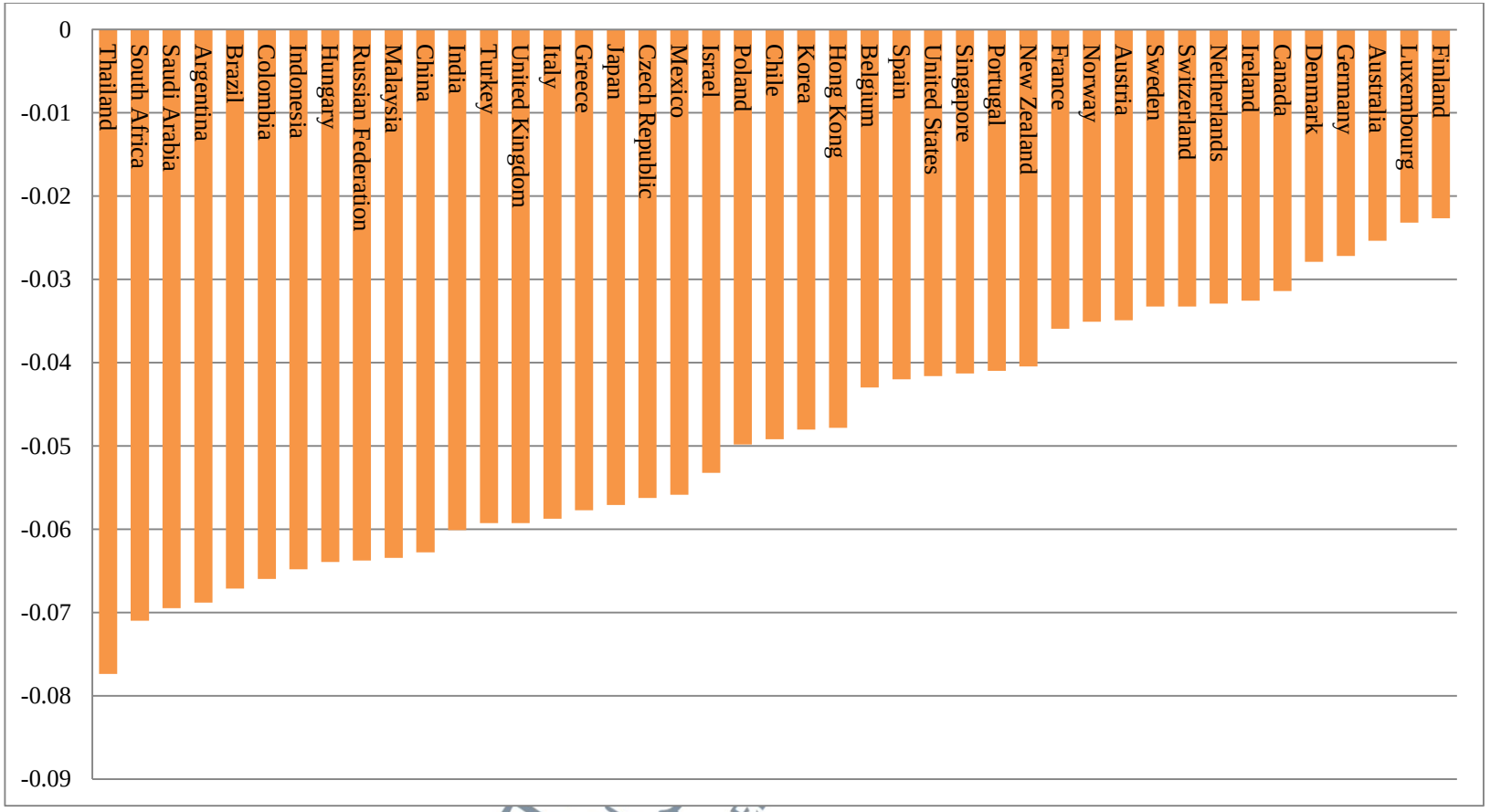

Figure 4.1: Effect of household debt on economic growth given conditional role of institutional quality by countries in 2008

In the second case, the result of the study reports the effect of household debt on growth depending on different levels of institutional quality. This is done by comparing the countries documenting the lowest level of institutional quality (Colombia) and the highest level of institutional quality (Finland), and also the countries which demonstrate the lowest variation in household debt (Argentina) and the highest one (Switzerland), as shown in Table 4.7. Keeping an average level of institutional quality in Colombia and all else constant, it was found that a 10% increase in household debt results in a 0.7% reduction in economic development. As institutional quality is the highest at 30.402 in Finland, a 1-point increase in household debt is associated with a 0.22% reduction in growth. While this keeps an average level of household debt, changes in institutional quality based on the interaction effect are deemed insignificant for Colombia, Finland, and Argentina. On the contrary, a 1-point increase in institutional quality significantly increases growth by 3.39% when there is an average level of household debt. A reduction of the adverse effect of household debt allows a consistently beneficial contribution of higher institutional quality on growth across countries. Notably, the degree of institutional quality is a conditional of the influence of household debt on economic growth. Switzerland, which records considerably high institutional quality with the highest household debt sees a significant improvement in growth with an increase in household debt. These results remark interesting facts that at a higher level of household debt, an average level of institutional quality has a strong and significant influence on growth and counters the hostile consequence of the interaction term when household debt is levelled.

Based on these results, it can be concluded that household debt and institutional quality complementarily lessen a country's sluggish economy at medium institutional

quality and high household debt levels. The findings further suggest that the investigated countries should enhance their institutional quality to realise the beneficial effect of household debt on the economic growth. Moreover, countries with considerably high levels of institutional quality may observe a positive impact of household debt on growth. Similarly, a higher level of household debt allows a more apparent and positive effect of institutional reforms on growth.

Table 4.7: Marginal effects of institutions and household debt on growth

	INS	HD	ΔGDPPCG/ΔINS	ΔGDPPCG/ΔHD
Lowest INS Colombia	18.181	17.733	-0.030	-0.07***
Highest INS Finland	30.402	44.55	0.074	-0.022*
Lowest HD Argentina	20.236	4.973	-0.079	-0.062***
Highest HD Switzerland	29.302	112.968	0.339**	-0.027**
Threshold INS	<31			-0.024*
Threshold HD		>53.5	0.109*	

Note: The calculation of marginal effect (i.e. ΔGDPPCG/ΔINS and ΔGDPPCG/ΔHD) follows that of Brambor et al. (2016). The threshold INS indicates that the role of institutional quality (more than 31) is insignificant in lessening the negative effect of household debt on growth. Meanwhile, the threshold HD shows that the household debt can play positive role in influencing the economic growth given the household debt ratio less than 53.5.

Understanding the substantial role of institutional quality in moderating the effect of household debt and economic growth can be explained in the bigger picture using a diagram. Figure 4.2, as shown above, illustrates the marginal effect of household debt on growth (based on the result in model BB column 3c). The y-axis is the marginal effect, while the *x*-axis is the values of institutional quality. The histogram in grey shows the number of countries based on certain institutional quality levels. For instance, institutional quality at the level of 26 to 29, the histogram is considerable at a high level, indicating that there were many countries with institutional quality levels between 26 to 29 points. The solid sloping line in the figure shows the marginal effects of household debt on economic

growth at each point of institutional quality. In contrast, the dotted lines illustrate the 95 percent confidence intervals. The marginal effects are statistically significant when the upper and lower bounds of the confidence intervals are not equal to zero. The upper bounds of confidence intervals intersect with zero, indicating that the institutional quality plays an insignificant role in moderating the effect of household debt on economic growth when the institutional quality is at level 31. So, the diagram in Figure 4.2 confirms the cases discussed above. Based on the figure below, it can be concluded that the negative effect of household debt on economic growth higher when the institutional quality level is lower than 30 points (the left-side of the red line). The lower the institutional quality, the lower the economic growth of the countries.

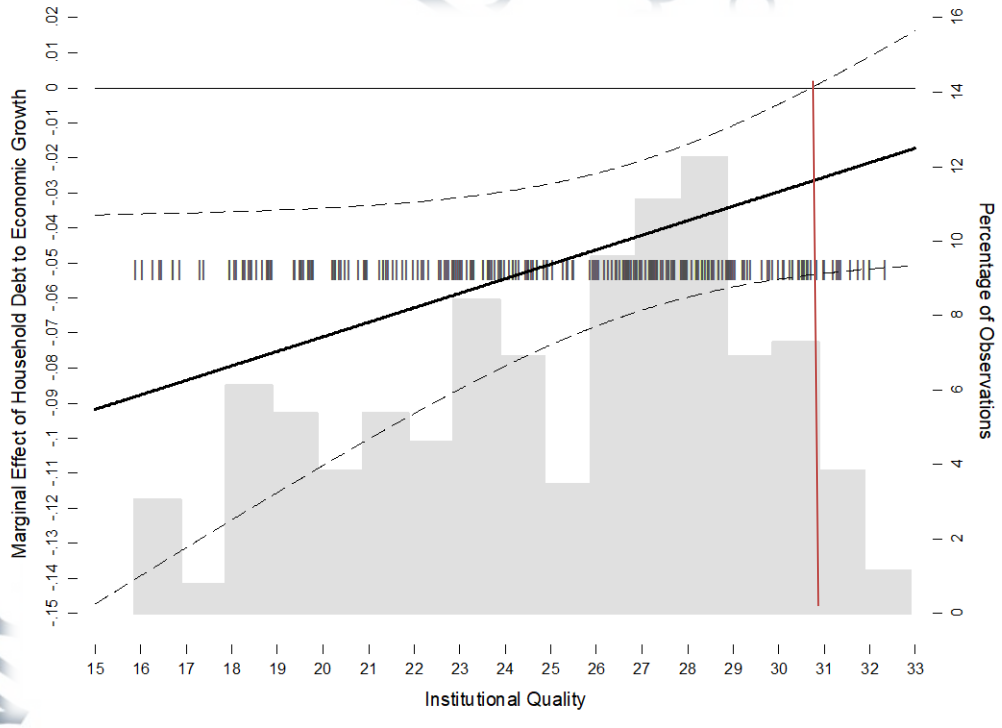

Figure 4.2: Marginal effect of interaction term HD*INS on economic growth

These empirical results also prove the vital role played by institutional quality in realising the positive effects on economic growth through household debt. Though there is a lack of direct evidence to support these findings, they nevertheless appear to be in line with several studies which explain that weak intuitions may impede growth through the role of financial institutions (see Acemoglu et al., 1998; Blackburn & Forgues-Puccio, 2010; Jha, 2019). This explains that a low institutional quality environment encourages the deregulation of financial lending practices, which in turn causes economic instability as a consequence of higher household debt. Furthermore, high corruption causes financial liberalisation to become more attractive but may or may not increase economic development. Thus, it is reasonable to assume that financial liberalisation in a low institutional quality environment can cause downside risk to economic expansion. Indeed, the slowdown in economic growth is caused by weak financial and political institutions, resulting in a weaker macroeconomy (Demirgüç-Kunt & Detragiache, 1998).

The pieces of empirical evidence presented in Tables 4.4 to 4.6 signify that institutional quality plays a supporting role in mediating the household debt association with growth in investigated countries. The results of the econometric analysis suggest a number of policy-relevant conclusions. First, the findings indicate that a higher household debt level is detrimental to economic growth. Second, a better level of institutional quality has a significant effect in boosting growth. Third, the negative effect of household debt on growth subsides at a higher level of institutional quality. Hence, policymakers should formulate appropriate policies to ease the effect of household debt on growth. They can propose measures that reinforce institutional quality reforms to enhance the role of household debt in boosting economic growth.

4.2.5 Further Analysis of Household debt, Institutional Quality, and Economic Growth

In this section, the study performed further analysis to ensure the credibility of the empirical results. The steps involve (i) splitting the sample into two subsamples: advanced economies (Tables 4.8–4.9) and emerging economies (Table 4.10–4.11), ii) analysing the estimated model by removing the outliers using Cooks'D (Table 4.12– 4.14), iii) using alternative estimation methods, namely first-difference GMM estimator (Table 4.15) and system-GMM estimator (Table 4.16).

First, the study further analysed the sample by dividing the countries into advanced and emerging economies. This categorisation allowed the study to establish robust evidence regarding the impact of institutional quality and household debt on economic growth, and examine the crisis dummy for both groups of economies. The results for household debt are robust and consistent in all specifications and statistically negative for advanced economies. The estimated coefficient for institutional quality is positive and the interaction term is positive but insignificant for advanced economies. For emerging economies, the coefficient for household debt is negative and statistically significant but when the interaction term is included, it becomes insignificant. Moreover, the coefficient for institutional quality is positive but insignificant for emerging economies. Although the results of institutional quality are more pronounced in advanced economies, the variation is not that great. However, the results posit that countries with greater household debt to GDP ratios such as advanced economies can experience a stronger effect on growth if the level of institutional quality is low, which is consistent with the findings of Bahadri and Valev (2020). Thus, it is noticeable that the sizable proportion of household credit in many

emerging markets and its rapid build-up should be observed with the same caution as a rapid build-up in in advanced economies.

Second, the empirical results were cross-checked by employing the Cooks'D method to assess robustness. The findings remain consistent and robust when estimates were made by analysing the sample that excludes the outliers. The results for the effect of household debt on growth remain negative, as shown in Table 4.12. The study found that the role of institutional quality in the relationship between household debt and economic growth is positively significant, as shown in Table 4.13. In addition, the interaction between household debt and institutional quality proves that the negative impact of household debt on growth increases at a lower level of institutional quality, as presented in Table 4.14. Thus, the study concludes that low-quality institutions may further speed up the effect of household debt on growth.

Tables 4.15 and 4.16 summarise the results of the regressions done by employing first-difference GMM and system GMM estimators developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) to determine the robustness of the study's results. In the empirical implementation, the study adjusted the two-step GMM standard errors for finite sample based on Windmeijer (2005) and adopted Roodman's (2009) suggestion in collapsing the instruments to keep the number of instruments below the number of cross-sectional units. Two specification tests, namely second-order autocorrelation (AR2 p-value) and Sargan test's p-value were conducted to observe whether both difference-GMM and system GMM estimators are consistent. First, the second-order residuals are serially correlated and insignificant, confirming that second-order serial correlation is absent. Second, the Sargan test of over-identifying restrictions

which identifies the overall validity of instrument indicates that the p-value in the Sargan test is insignificant. These findings suggest that the overall instruments are valid. The pieces of empirical evidence are consistent and robust, signifying the supporting role of institutional quality in mediating the household debt association with growth in the investigated countries.

The results of the econometric analysis suggest a number of policy-relevant conclusions. First, the findings indicate that higher levels of household debt are detrimental to economic growth. Second, a better level of institutional quality significantly spurs growth. Third, the negative effect of household debt on growth worsens at lower levels of institutional quality. Hence, policymakers need to formulate appropriate policies to ease the effect of household debt on growth. They can propose measures that reinforce institutional quality reforms to enhance the role of household borrowings in boosting economic growth.

Table 4.8: Household Debt and Economic Growth in Advanced Economies (No Crisis Dummy)

Independent Variables	LSDVC (with HD)			LSDV (with HD & INS)			LSDVC (with HD, INS, HD*INS)		
	AH	AB	BB	AH	AB	BB	AH	AB	BB
HD	-0.044***	-0.045***	-0.047***	-0.049***	-0.050***	-0.051***	-0.124*	-0.128*	-0.131*
	(0.011)	(0.01)	(0.01)	(0.007)	(0.007)	(0.008)	(0.073)	(0.068)	(0.074)
INS				0.154**	0.156**	0.153*	0.044	0.042	0.038
				(0.078)	(0.073)	(0.079)	(0.159)	(0.147)	(0.162)
HD*INS							0.003	0.003	0.003
							(0.003)	(0.002)	(0.003)
L.GDPPCG	-0.160*	-0.165**	-0.132	-0.283***	-0.291***	-0.252***	-0.246***	-0.259***	-0.223***
	(0.082)	(0.078)	(0.082)	(0.073)	(0.07)	(0.081)	(0.076)	(0.074)	(0.084)
GCF	0.282***	0.285***	0.289***	0.329***	0.331***	0.330***	0.317***	0.319***	0.320***
	(0.057)	(0.051)	(0.055)	(0.046)	(0.043)	(0.046)	(0.047)	(0.044)	(0.048)
POPG	-0.916**	-0.914**	-0.919**	-1.375***	-1.367***	-1.360***	-1.360***	-1.349***	-1.341***
	(0.445)	(0.4)	(0.435)	(0.403)	(0.373)	(0.409)	(0.423)	(0.392)	(0.432)
HC	-0.106	-0.098	-0.091	-0.05	-0.039	-0.028	0.042	0.052	0.061
	(0.112)	(0.101)	(0.111)	(0.086)	(0.079)	(0.088)	(0.093)	(0.085)	(0.094)
TO	0.031**	0.031**	0.031**	0.018*	0.017*	0.017*	0.025**	0.024**	0.025**
	(0.014)	(0.013)	(0.014)	(0.01)	(0.009)	(0.01)	(0.011)	(0.01)	(0.011)
INF	-0.166***	-0.169***	-0.176***	-0.189***	-0.187***	-0.189***	-0.189***	-0.189***	-0.192***
	(0.058)	(0.052)	(0.057)	(0.043)	(0.04)	(0.044)	(0.049)	(0.045)	(0.049)
Observations	155	155	155	141	141	141	141	141	141
N	22	22	22	22	22	22	22	22	22

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.9: Household Debt and Economic Growth in Advanced Economies (With Crisis Dummy)

Independent Variables	LSDVC (with HD)			LSDV (with HD & INS)			LSDVC (with HD, INS, HD*INS)		
	AH	AB	BB	AH	AB	BB	AH	AB	BB
HD	-0.041***	-0.042***	-0.043***	-0.047***	-0.048***	-0.049***	-0.119*	-0.123*	-0.125*
	(0.010)	(0.009)	(0.010)	(0.007)	(0.007)	(0.008)	(0.071)	(0.066)	(0.071)
INS				0.145*	0.146**	0.144*	0.023	0.021	0.018
				(0.076)	(0.071)	(0.077)	(0.151)	(0.141)	(0.153)
HD*INS							0.003	0.003	0.003
							(0.003)	(0.002)	(0.003)
L.GDPPCG	-0.132	-0.133*	-0.102	-0.242***	-0.248***	-0.208**	-0.215***	-0.223***	-0.188**
	(0.081)	(0.078)	(0.081)	(0.080)	(0.078)	(0.087)	(0.081)	(0.078)	(0.086)
GCF	0.277***	0.280***	0.280***	0.324***	0.325***	0.324***	0.312***	0.314***	0.312***
	(0.055)	(0.050)	(0.054)	(0.046)	(0.043)	(0.046)	(0.045)	(0.043)	(0.046)
POPG	-0.788*	-0.786**	-0.787*	-1.265***	-1.257***	-1.241***	-1.223***	-1.214***	-1.197***
	(0.430)	(0.389)	(0.419)	(0.395)	(0.369)	(0.401)	(0.407)	(0.379)	(0.412)
HC	-0.102	-0.094	-0.089	-0.046	-0.035	-0.020	0.016	0.025	0.032
	(0.106)	(0.096)	(0.104)	(0.086)	(0.080)	(0.088)	(0.089)	(0.081)	(0.089)
TO	0.026**	0.026**	0.026**	0.016*	0.016*	0.016	0.022**	0.022**	0.022**
	(0.013)	(0.012)	(0.013)	(0.010)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)
INF	-0.174***	-0.176***	-0.182***	-0.195***	-0.193***	-0.194***	-0.197***	-0.196***	-0.199***
	(0.055)	(0.049)	(0.054)	(0.042)	(0.039)	(0.043)	(0.047)	(0.043)	(0.047)
CRISIS	-4.783***	-4.787***	-4.802***	-3.035**	-3.049***	-3.135**	-4.013***	-4.001***	-4.087***
	(1.188)	(1.086)	(1.168)	(1.249)	(1.167)	(1.253)	(1.184)	(1.097)	(1.174)
Observations	155	155	155	141	141	141	141	141	141
N	22	22	22	22	22	22	22	22	22

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.10: Household Debt and Economic Growth in Emerging Economies (No Crisis Dummy)

Independent Variables	LSDVC (with HD)			LSDV (with HD & INS)			LSDVC (with HD, INS, HD*INS)		
	AH	AB	BB	AH	AB	BB	AH	AB	BB
HD	-0.077**	-0.076**	-0.085*	-0.072**	-0.071**	-0.076**	0.022	0.019	0.043
	(0.034)	(0.033)	(0.05)	(0.029)	(0.028)	(0.037)	(0.101)	(0.099)	(0.129)
INS				-0.072	-0.07	-0.078	0.051	0.049	0.077
				(0.076)	(0.074)	(0.098)	(0.158)	(0.156)	(0.207)
HD*INS							-0.004	-0.004	-0.005
							(0.005)	(0.004)	(0.006)
L.GDPPCG	-0.156	-0.18	-0.03	-0.221**	-0.240**	-0.164	-0.217**	-0.237**	-0.157
	(0.122)	(0.113)	(0.14)	(0.111)	(0.106)	(0.121)	(0.108)	(0.102)	(0.118)
GCF	0.094	0.098	0.079	0.171**	0.173**	0.173*	0.167**	0.169**	0.168*
	(0.067)	(0.063)	(0.092)	(0.073)	(0.072)	(0.088)	(0.073)	(0.072)	(0.089)
POPG	-1.355***	-1.337***	-1.371**	-1.531***	-1.512***	-1.563**	-1.486***	-1.468***	-1.508**
	(0.465)	(0.435)	(0.638)	(0.51)	(0.493)	(0.627)	(0.514)	(0.494)	(0.627)
HC	-0.177	-0.177	-0.161	-0.132	-0.136	-0.12	-0.114	-0.118	-0.096
	(0.144)	(0.136)	(0.202)	(0.114)	(0.111)	(0.142)	(0.116)	(0.113)	(0.144)
TO	0.021***	0.021***	0.023**	0.023***	0.023***	0.024**	0.023***	0.023***	0.024**
	(0.008)	(0.008)	(0.012)	(0.008)	(0.008)	(0.011)	(0.008)	(0.008)	(0.011)
INF	-0.035*	-0.034*	-0.031	-0.029*	-0.028*	-0.026	-0.025*	-0.025*	-0.022
	(0.019)	(0.018)	(0.029)	(0.016)	(0.015)	(0.02)	(0.015)	(0.015)	(0.02)
Observations	90	90	90	87	87	87	87	87	87
N	21	21	21	21	21	21	21	21	21

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.11: Household Debt and Economic Growth in Emerging Economies (With Crisis Dummy)

Independent Variables	LSDVC (with HD)			LSDV (with HD & INS)			LSDVC (with HD, INS, HD*INS)		
	AH	AB	BB	AH	AB	BB	AH	AB	BB
HD	-0.061*	-0.060*	-0.062	-0.064**	-0.064**	-0.064	0.021	0.018	0.042
	(0.034)	(0.033)	(0.05)	(0.031)	(0.03)	(0.04)	(0.102)	(0.099)	(0.131)
INS				-0.047	-0.047	-0.042	0.061	0.057	0.093
				(0.083)	(0.081)	(0.109)	(0.16)	(0.159)	(0.213)
HD*INS							-0.004	-0.004	-0.005
							(0.005)	(0.004)	(0.006)
L.GDPPCG	-0.108	-0.132	0.048	-0.190*	-0.213**	-0.12	-0.192*	-0.217**	-0.12
	(0.125)	(0.117)	(0.149)	(0.111)	(0.106)	(0.122)	(0.109)	(0.101)	(0.118)
GCF	0.098	0.101	0.083	0.164**	0.166**	0.163*	0.162**	0.165**	0.161*
	(0.066)	(0.063)	(0.093)	(0.073)	(0.072)	(0.09)	(0.073)	(0.072)	(0.09)
POPG	-1.386***	-1.368***	-1.433**	-1.519***	-1.498***	-1.558**	-1.482***	-1.460***	-1.510**
	(0.46)	(0.433)	(0.636)	(0.513)	(0.494)	(0.632)	(0.521)	(0.497)	(0.633)
HC	-0.251*	-0.249*	-0.272	-0.177	-0.177	-0.183	-0.152	-0.153	-0.152
	(0.145)	(0.138)	(0.207)	(0.132)	(0.129)	(0.17)	(0.134)	(0.131)	(0.172)
TO	0.022***	0.022***	0.024**	0.023***	0.023***	0.025**	0.023***	0.023***	0.025**
	(0.008)	(0.008)	(0.012)	(0.008)	(0.008)	(0.011)	(0.008)	(0.008)	(0.011)
INF	-0.042**	-0.040**	-0.043	-0.033**	-0.032*	-0.033	-0.029*	-0.029*	-0.028
	(0.019)	(0.018)	(0.028)	(0.017)	(0.016)	(0.022)	(0.016)	(0.016)	(0.021)
CRISIS	-4.308	-4.077	-6.034	-2.325	-2.153	-3.01	-1.903	-1.728	-2.531
	(2.857)	(2.758)	(4.307)	(3.034)	(2.99)	(3.968)	(3.074)	(2.974)	(3.967)
Observations	90	90	90	87	87	87	87	87	87
N	21	21	21	21	21	21	21	21	21

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.12: Outliers Cooks'D – Household Debt and Economic Growth

Independent Variables	LSDVC			LSDVC (with Crisis Dummy)		
	AH	AB	BB	AH	AB	BB
HD	-0.028***	-0.029***	-0.030***	-0.022**	-0.023**	-0.024**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)
L.GDPPCG	-0.139*	-0.145**	-0.126*	-0.109	-0.111	-0.092
	(0.075)	(0.070)	(0.071)	(0.080)	(0.074)	(0.075)
GCF	0.168***	0.171***	0.171***	0.153***	0.155***	0.153***
	(0.049)	(0.045)	(0.046)	(0.046)	(0.043)	(0.044)
POPG	-0.567*	-0.571**	-0.568**	-0.494*	-0.498*	-0.492*
	(0.304)	(0.281)	(0.286)	(0.288)	(0.271)	(0.278)
HC	-0.098	-0.095	-0.086	-0.128	-0.125	-0.119
	(0.087)	(0.080)	(0.083)	(0.084)	(0.079)	(0.082)
TO	0.009	0.010	0.009	0.008	0.009	0.008
	(0.010)	(0.009)	(0.010)	(0.010)	(0.009)	(0.009)
INF	-0.026**	-0.026**	-0.027**	-0.032**	-0.032***	-0.033***
	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)	(0.012)
CRISIS				-3.897***	-3.865***	-3.938***
				(1.105)	(1.035)	(1.062)
Obs	229	229	229	229	229	229
N	42	42	42	42	42	42
Notes: South Africa countries were removed as all values indicates outliers						

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.13: Outliers Cooks'D - Institutional Quality and Economic Growth

Independent Variables	LSDVC			LSDVC (with Crisis Dummy)		
	AH	AB	BB	AH	AB	BB
HD	-0.032***	-0.033***	-0.035***	-0.026**	-0.027***	-0.028***
	(0.01)	(0.009)	(0.01)	(0.01)	(0.009)	(0.01)
INS	0.051**	0.051***	0.053***	0.057***	0.057***	0.059***
	(0.02)	(0.019)	(0.019)	(0.02)	(0.018)	(0.019)
L.GDPPCG	-0.182**	-0.193***	-0.167**	-0.141*	-0.149**	-0.124*
	(0.074)	(0.069)	(0.07)	(0.076)	(0.071)	(0.071)
GCF	0.220***	0.222***	0.221***	0.199***	0.202***	0.199***
	(0.049)	(0.045)	(0.046)	(0.047)	(0.044)	(0.045)
POPG	-0.834**	-0.832***	-0.830***	-0.750**	-0.749**	-0.743**
	(0.341)	(0.313)	(0.321)	(0.329)	(0.306)	(0.315)
HC	-0.157*	-0.151*	-0.144	-0.193**	-0.187**	-0.181**
	(0.093)	(0.086)	(0.089)	(0.089)	(0.083)	(0.087)
TO	0.017**	0.017**	0.017**	0.016**	0.016**	0.016**
	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
INF	-0.022	-0.022	-0.022	-0.029*	-0.028**	-0.028**
	(0.016)	(0.014)	(0.015)	(0.015)	(0.014)	(0.014)
CRISIS				-3.907***	-3.862***	-3.976***
				(1.042)	(0.965)	(0.995)
Obs	217	217	217	217	217	217
N	43	43	43	43	43	43

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.14: Outliers Cooks'D – Interaction Term

Independent Variables	LSDVC			LSDVC (with Crisis Dummy)		
	AH	AB	BB	AH	AB	BB
HD	-0.122***	-0.125***	-0.127***	-0.130**	-0.131**	-0.137**
	(0.044)	(0.042)	(0.042)	(0.057)	(0.054)	(0.056)
INS	-0.061	-0.061	-0.061	-0.121	-0.122	-0.126
	(0.082)	(0.079)	(0.086)	(0.119)	(0.111)	(0.115)
HD*INS	0.003*	0.003*	0.003*	0.004*	0.004**	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
L.GDPPCG	-0.284***	-0.297***	-0.254***	-0.181**	-0.183**	-0.156**
	(0.065)	(0.062)	(0.061)	(0.08)	(0.076)	(0.08)
GCF	0.252***	0.254***	0.252***	0.177***	0.178***	0.175***
	(0.041)	(0.04)	(0.039)	(0.039)	(0.037)	(0.038)
POPG	-1.222***	-1.213***	-1.205***	-0.746**	-0.745**	-0.740**
	(0.342)	(0.33)	(0.354)	(0.315)	(0.295)	(0.311)
HC	-0.06	-0.06	-0.046	-0.085	-0.08	-0.071
	(0.069)	(0.067)	(0.073)	(0.07)	(0.065)	(0.07)
TO	0.027***	0.027***	0.028***	0.01	0.01	0.009
	(0.006)	(0.006)	(0.008)	(0.008)	(0.007)	(0.008)
INF	-0.017	-0.017	-0.016	-0.034**	-0.034**	-0.035**
	(0.016)	(0.015)	(0.012)	(0.015)	(0.014)	(0.014)
CRISIS				-4.346***	-4.354***	-4.476***
				(1.033)	(0.961)	(1.022)
Obs	216	216	216	216	216	216
N	43	43	43	43	43	43
Marginal Effect						
Mean	-0.038***	-0.039***	-0.041***	-0.034***	-0.035***	-0.036***
Min	-0.072***	-0.073***	-0.077***	-0.070***	-0.070***	-0.073***
Max	-0.012***	-0.013	-0.013	-0.007	-0.007	-0.007

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.15: First-Difference GMM Analysis

Independent Variables	1st Diff-GMM			1st Diff-GMM (with Crisis Dummy)		
HD	-0.081***	-0.079***	-0.073***	-0.075***	-0.147***	-0.163***
	(0.019)	(0.007)	(0.006)	(0.017)	(0.029)	(0.027)
INS		0.109***	0.092***		0.001	-0.03
		(0.028)	(0.02)		(0.056)	(0.048)
HD*INS			0.002**			0.003***
			(0.001)			(0.001)
L.GDPPCG	-0.358***	-0.366***	-0.335***	-0.311***	-0.380***	-0.364***
	(0.085)	(0.016)	(0.017)	(0.089)	(0.018)	(0.022)
GCF	0.213***	0.263***	0.251***	0.207***	0.265***	0.237***
	(0.057)	(0.03)	(0.027)	(0.066)	(0.031)	(0.029)
POPG	-0.938**	-1.293***	-1.217***	-0.860*	-1.311***	-1.223***
	(0.400)	(0.096)	(0.102)	(0.462)	(0.098)	(0.099)
HC	0.041	0.157***	0.111***	0.021	0.183***	0.184***
	(0.091)	(0.045)	(0.04)	(0.096)	(0.046)	(0.053)
TO	0.018***	0.019***	0.017***	0.017***	0.019***	0.016***
	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)
INF	-0.043	-0.040***	-0.038***	-0.045	-0.040***	-0.036***
	(0.031)	(0.008)	(0.005)	(0.030)	(0.008)	(0.006)
CRISIS				-2.539**	-2.180***	1.468***
				(1.185)	(0.413)	(0.467)
Constant	-1.995	-14.924***	-10.861***	-0.551	-14.036***	-12.707***
	(6.967)	(4.091)	(3.353)	(7.560)	(3.705)	(3.782)
Obs	202	185	185	202	185	185
N	43	43	43	43	43	43
Instruments	41	36	36	42	37	38
AR2 p-value	0.1064	0.1063	0.2409	0.315	0.1572	0.1322
Sargan p-value	0.874	0.6795	0.7404	0.8709	0.7167	0.7839

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.16: System GMM Analysis

Independent Variables	1st Diff-GMM			1st Diff-GMM (with Crisis Dummy)		
HD	-0.064***	-0.085***	-0.077***	-0.057***	-0.242***	-0.229***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.025)	(0.026)
INS		0.033*	0.043**		-0.197***	-0.187***
		(0.017)	(0.02)		(0.039)	(0.04)
HD*INS			0.006***			0.006***
			(0.001)			(0.001)
L.GDPPCG	-0.281***	-0.338***	-0.320***	-0.243***	-0.375***	-0.349***
	(0.024)	(0.013)	(0.012)	(0.030)	(0.015)	(0.016)
GCF	0.199***	0.270***	0.259***	0.188***	0.300***	0.274***
	(0.018)	(0.02)	(0.019)	(0.018)	(0.02)	(0.018)
POPG	-0.352***	-0.848***	-0.635***	-0.252**	-1.203***	-0.976***
	(0.125)	(0.089)	(0.095)	(0.113)	(0.11)	(0.103)
HC	-0.014	0.187***	0.140***	-0.027	0.235***	0.179***
	(0.032)	(0.039)	(0.043)	(0.037)	(0.037)	(0.036)
TO	-0.000	0.005***	0.005***	-0.002	0.007***	0.005***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
INF	-0.042***	-0.040***	-0.039***	-0.042***	-0.033**	-0.034***
	(0.009)	(0.012)	(0.008)	(0.008)	(0.014)	(0.01)
CRISIS				-3.720***	-3.189***	-2.387***
				(0.541)	0.494	0.576
Constant	2.620	-14.187***	-11.075***	3.567	-12.644***	-8.330***
	(2.407)	(3.199)	(3.466)	(2.870)	(2.939)	(2.742)
Obs	245	228	228	245	228	228
N	43	43	43	43	43	43
Instruments	37	37	38	37	38	39
AR2 p-value	0.2299	0.2694	0.6011	0.8416	0.3571	0.576
Sargan p-value	0.447	0.1799	0.1832	0.4043	0.2507	0.2699

Notes: GDPPCG = Gross domestic product per capita growth (as dependent variable), GCF = gross capital formation, POPG = population growth, HC = human capital, TO = trade openness, INF = inflation, HD = household debt, INS = institutional quality, HD*INS = interaction term, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

4.3 Determinants of Household Debt

This section discusses the second research objective of the study, which is to examine the role of financial development along with other determinants of household debt. The empirical results were regressed using a bias corrected Least Square Dummy Variables (LSDVC) for a panel data of 41 countries between year 1980 and 2018. The study faced some limitation of information, particularly for Argentina and Saudi Arabia, and hence, these countries were excluded from the sample. A preliminary analysis of the variables used in the model is presented in subsection 4.3.1. Then, subsection 4.3.2 discusses the empirical findings on the determinants of household debt. The empirical evidence on the effect of financial development on household debt is explained in subsection 4.3.3. Lastly, subsection 4.3.4 discusses a further analysis to test for robustness.

4.3.1 Descriptive Statistic

Table 4.17 provides the summary statistics analysis for all variables in the model for 41 countries. The descriptive analysis includes household debt to GDP ratio (HD), GDP per capita (GDPPC), unemployment (UN), working population (WPOP), inflation (INF), lending interest rate (LIR), real house price index (HPI), and financial development index (FD).

As demonstrated in Table 4.17, the overall mean of household debt to GDP ratio is 52.05%, with minimum and maximum values of 1.82% (Russian Federation) and 130.3% (Denmark), respectively. GDP per capita is USD32,708.86 on average with the minimum value of USD889.77 (India) and maximum value of USD107,119 (Luxembourg). For unemployment, the mean is 7.6% while the lowest and highest values are 0.59% (Thailand)

and 31.3% (South Africa), respectively. The average value for working population is 67.05% with the lowest value of 60.32% (Japan) and the highest value of 78.51% (Singapore). The mean value for inflation is 3.62% with the minimum and maximum values of –3.634% (Hong Kong) and 35.121% (Turkey), respectively. Turkey suffered from an economic crisis in 2001 due to an unstable political landscape that led to huge capital outflows by foreign investors. The average lending interest rate is 7.925% with the minimum and maximum values of 0.047% (Switzerland) and 60% (Brazil), respectively. Brazil experienced an economic recession in 2015 and the lack of competition among banks caused the bank lending interest rate to shoot up.

Table 4.17: Descriptive Statistics for the Household Debt Model

Variable	Mean	Std.Dev.	Min	Max
HD	52.05	28.169	1.82	130.3
GDPPC	32708.86	21138.36	889.772	107119
UN	7.567	4.711	0.588	31.326
WPOP	67.049	2.963	60.322	78.505
INF	3.619	3.903	-3.634	35.121
LIR	7.925	7.699	0.047	59.866
CON	55.339	7.85	30.618	70.03
HPI	91.727	27.976	28.186	173.344
FD	60.8	16.8	20.4	94.2

Notes: Household debt (HD) is the dependent variable. Explanatory variables are GDP per capita (GDPPC), unemployment (UN), working population (WPOP), inflation (INF), lending interest rate (LIR), real house price index (HPI), and financial development index (FD). All variables are in percentage, except for GDP per capita.

The overall mean for consumption is 55.4% with a huge variation from the minimum of 30.62% (Luxembourg) to the maximum of 70% (Greece). House price index has a considerable variation, ranging from 28.2 point (Spain) to 173.34 point (Japan) with the average of 91.73 point. Financial development index refers to the variation in the level of financial systems' development across the countries. The highest point of 100% represents

the most developed financial system. For this dataset, the overall mean of financial development index is 60.8%, with a minimum value of 20.4% (Colombia) and a maximum value of 94.2% (Switzerland).

Table 4.18: Correlation Matrix for the Household Debt Model

Variables	HD	GDPPC	UN	WPOP	LIR	INF	CON	HPIR	FD
HD	1								
GDPPC	0.698	1							
	(0.000)								
UN	-0.151	0.079	1						
	(0.022)	(0.233)							
WPOP	0.048	-0.029	-0.289	1					
	(0.467)	(0.661)	(0.000)						
LIR	-0.567	-0.523	0.232	0.018	1				
	(0.000)	(0.000)	(0.000)	(0.786)					
INF	-0.599	-0.476	0.11	-0.127	0.644	1			
	(0.000)	(0.000)	(0.098)	(0.056)	(0.000)				
CON	-0.184	-0.286	0.325	-0.306	0.375	0.168	1		
	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)			
HPI	0.164	-0.078	-0.35	0.138	-0.396	-0.196	-0.067	1	
	(0.013)	(0.243)	(0.000)	(0.037)	(0.000)	(0.003)	(0.315)		
FD	0.759	0.6	-0.184	0.187	-0.603	-0.596	-0.192	0.27	1
	(0.000)	(0.000)	(0.005)	(0.005)	(0.000)	(0.000)	(0.004)	(0.000)	

Notes: Household debt (HD) is the dependent variable. Explanatory variables are GDP per capita (GDPPC), unemployment (UN), working population (WPOP), inflation (INF), lending interest rate (LIR), real house price index (HPI), and financial development index (FD). All variables are in percentage, except for GDP per capita.

Table 4.18 reports the pairwise correlation analysis for all the regressors. GDP per capita, house price, and financial development index are positively correlated and statistically significant with household debt. Meanwhile, inflation, lending interest rate, consumption and unemployment are negatively correlated and statistically significant with household debt. Among the variables in the correlation matrix, financial development index shows the highest correlation with household debt with 0.76. Additionally, Table 4.19 shows the variance inflation factor (VIF) values of the explanatory variables. The VIF of

the variables do not exceed the cut-off point of 10 as suggested by Hair et al. (1995) and Gujarati and Porter (2003) and the mean value stands at 2.43, indicating no serious collinearity problem.

Table 4.19: Variance Inflation Factor for RO3

	VIF	**1/VIF**
GDPPC	2.793	0.358
UN	1.359	0.736
WPOP	1.505	0.664
INF	2.205	0.454
LIR	2.133	0.469
CON	1.816	0.551
HPI	1.274	0.785
FD	4.542	0.22
Mean VIF	2.431	.

Notes: Household debt (HD) is the dependent variable. Explanatory variables are GDP per capita (GDPPC), unemployment (UN), working population (WPOP), inflation (INF), lending interest rate (LIR), real house price index (HPI), and financial development index (FD). All variables are in percentage, except for GDP per capita.

4.3.2 **Determinants of Household Debt**

This section reports the results of baseline regression analysis, which investigates the dynamic regression of the factors influencing household debt by employing LSDVC (AH), LSDVC (AB), and LSDVC (BB) estimations replicated with 50 repetitions using a bootstrap procedure to produce the estimated standard errors. Table 4.20 shows the baseline regression in each column 4a to 4c based on LSDVC[15] AH, AB, and BB, respectively, while the analysis model with the crisis dummy variable[16] is presented in columns 4d to 4f.

The results in Table 4.20 indicate that the lagged dependent variable is positively significant, suggesting that household debt is persistent. Moreover, the persistence implies that household debt is dependent on the stock of household debt in the previous year and is sustained from one year to the next. Regarding the determinants of household debt (columns 4a–4f), unemployment and inflation are negatively correlated with household debt, but lending interest rate, household consumption, and house price index have a positive correlation. In addition, the crisis dummy is positive and statistically significant, signifying that household debt accumulation increases during banking crises. Income per capita is significant when the model is regressed with the crisis dummy. Meanwhile, working population is statistically insignificant throughout the models in columns 4a–4b.

[15] A bias-corrected Least Square Dummy Variables (LSDVC) estimator proposed by Bruno (2005b) based on modifications by Anderson and Hsiao (AH, 1981), Arellano and Bond (AB, 1991), Blundell and Bond (BB, 1998).

[16] Following Cecchetti et al. (2011), five-year average is commonly used in growth literature to reduce the potential effects of cyclical movements. However, some previous studies such as Dahir, Mahat, and Razak (2019) were concerned with biased results if there are any omitted variables since the CRISIS dummy variable may present structural breaks in further analysis.

Table 4.20: LSDVC Analysis – Determinants of Household Debt

Independent variables	LSDVC			LSDVC (with Crisis Dummy)		
	AH	AB	BB	AH	AB	BB
	4a	4b	4c	4d	4e	4f
LAG.HD	0.416***	0.412***	0.449***	0.413***	0.408***	0.443***
	(0.043)	(0.043)	(0.045)	(0.042)	(0.042)	(0.044)
GDPPC	-0.217	-0.209	-0.252	-0.234*	-0.226*	-0.266*
	(0.14)	(0.138)	(0.163)	(0.139)	(0.137)	(0.162)
UN	-0.105***	-0.105***	-0.103**	-0.111***	-0.111***	-0.110**
	(0.041)	(0.04)	(0.046)	(0.04)	(0.04)	(0.046)
WPOP	0.565	0.556	0.634	0.731	0.719	0.789
	(0.596)	(0.585)	(0.686)	(0.591)	(0.58)	(0.678)
INF	-0.110***	-0.111***	-0.107***	-0.107***	-0.107***	-0.105***
	(0.02)	(0.019)	(0.023)	(0.02)	(0.019)	(0.022)
LIR	0.076**	0.076**	0.068	0.062*	0.063*	0.055
	(0.037)	(0.036)	(0.041)	(0.037)	(0.036)	(0.041)
CON	0.529**	0.527**	0.517*	0.515**	0.514**	0.505*
	(0.232)	(0.228)	(0.267)	(0.23)	(0.226)	(0.263)
HPI	0.421***	0.420***	0.420***	0.390***	0.388***	0.389***
	(0.056)	(0.055)	(0.065)	(0.054)	(0.053)	(0.062)
CRISIS				0.307**	0.304**	0.302**
				(0.125)	(0.123)	(0.146)
Obs	187	187	187	187	187	187
N	41	41	41	41	41	41

Notes: HD = household debt (as dependent variable), GDPPC = Gross domestic product per capita, UN = unemployment, WPOP = working population, INF = inflation, LIR = lending interest rate, CON = household consumption, HPI = real house price index, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

The unemployment is negatively significant with coefficients −0.105, −0.105, −0.103, −0.111, −0.111, and −0.11 as shown in Table 4.20 (4a–4f). Unemployment has a negative impact on household debt, suggesting that a 1% increase in unemployment reduces household debt in investigated countries by 0.105%, 0.105%, 0.103%, 0.111%, 0.111%, and 0.11%, respectively. The result supports previous research by Meng et al. (2013), Hoang and Meng (2015), and Kusairi et al. (2019), which claimed that unemployment rate has a negative relationship with household debt. Household debt is increased by a low rate of unemployment signalled by a good labour market. Since a low unemployment rate portrays positive income and cash flows, households are expected to increase their expenditure and demand for credit as they have more purchasing power. They obtain more loans due to strong abilities to pay off debt obligations as there is stability in income generation. On the other hand, the sudden shock of losing a job may also influence households' decision on debt. Hence, a lower unemployment rate significantly increases the change in household debt.

Inflation is negatively significant at the 1% confidence level. The coefficients of inflation are −0.110, −0.111, −0.107, and −0.105, suggesting that a 1% increase in inflation reduces household debt in investigated countries by 0.11%, 0.111%, 0.107%, and 0.105%, as shown in columns 4a to 4f. This finding is consistent with Debelle (2004), Meng et al. (2013), and Catherine et al. (2016), which found that a rise in household debt can be explained by a decline in inflation. The studies suggest that a low inflation rate could cause an increase in household debt because it may ease the financial constraints on households. Lower inflation leads to lower interest rates and thus less income is needed for the reduced scheduled payment, and it encourages lending as lower inflation erodes principal more

slowly. In contrast, when inflation is high, fewer funds are lent and household debt will decrease.

Regarding the explanatory variables, lending interest rate is positively correlated with household debt. The magnitudes of lending interest rate are 0.076, 0.062, and 0.063 in both models in LSDVC AH(4a, 4d) and AB(4b, 4e) estimation methods and statistically significant. These results indicate that a 1% increase in the lending interest rate increases the household debt by 0.076%, 0.062%, and 0.063%. This outcome contradicts Barnes and Young (2003), which insisted that low lending interest rates spark the growth of household debt, but the hypothesis may not applicable in other countries as it was modelled exclusively for the US. This study's result is in line with the findings of Anderson et al. (2014) and Catherine et al. (2016), who studied the relationship between household debt and interest rate. They found a positive and significant relationship, which is explained through the phenomenon of economic boom phase. There is vigorous demand for debt to finance high consumer expenditure and investment. In turn, financial institutions actively offer loans designated in a financial liberalisation setting, i.e., lax lending regulation, eased liquidity constraint, or low interest rates. This rising of trend household loans is attributed to the historically low interest rates across the world (Barba & Pivetti, 2008; Mian & Sufi, 2018). However, given the strong demand for loans, households are less sensitive to the increase in lending interest rate by the financial market which enjoys a good profit margin in a prosperous economy (Debelle, 2006). In addition, before the onset of the global financial crisis, while households with good credit profiles might obtain standard interest rate loans, households with a poor credit profile were provided with access to sub-mortgage credit which imposed higher interest rates and increased the debt servicing burden (Mian

& Sufi, 2009). Thus, household debt increases with an increase in the lending interest rate. Nevertheless, the heterogeneity effect of countries' characteristics in a cross-sectional sample should be considered, hence the study performed further analysis by splitting the sample into advanced and emerging economies and the findings surprisingly produced different signs for different subsamples (further discussion in subsection 4.3.4).

Household consumption is positively correlated with household debt. The coefficients of household consumption are significant and relatively high at 0.529, 0.527, 0.517, 0.515, 0.514, and 0.505 (columns 4a–4c). A 1% increase in household consumption would lead to an increase in household debt by 0.529%, 0.527%, 0.517%, 0.515%, 0.514%, and 0.505%, respectively. This finding is consistent with the theoretical assumption of the life cycle model that debt is a tool for smoothening consumption (Barnes & Young, 2003; Tudela & Young, 2005). Intuitively, household debt is essential to fill up the shortage of income for households to finance their daily consumption. According to Fisher (1930), insufficient earning to finance consumption causes households to borrow. This result implies the main factor for rising household debt is the need to finance households' budget shortage for consumption. Thus, consumption has a positive effect on household debt accumulation.

The rise in household debt is also positively affected by house prices. The coefficients of house price are between 0.388 and 0.421 (columns 4a–4f) and statistically significant at the 1% confidence level. Household debt increases by 0.388% to 0.421% as house prices increase by 1%. This result is supported by many studies including Wildauer and Stockhammer (2018), Rubaszek and Serwa (2013), Mian and Sufi (2009), Philbrick and Gustafsson (2010), and Colletta and Bonis (2018). These studies concluded that house price

positively influences household debt. Households' behaviour, other than increasing their borrowings to finance consumer non-durable expenditure, is to increase their borrowings to invest in assets. Indeed, Minsky (2008) argued that debt-financing for investment increases during an economic boom.

Lastly, income per capita is insignificant in the first model (4a to 4c) but when the crisis dummy is included, the coefficients of income per capita are −0.234 to −0.266, negatively significant (at 10% confidence level). A 1% reduction in income per capita increases household debt by 0.234% to 0.266%. This result contradicts the studies of Ma'in et al. (2016), Rubaszek and Serwa (2014), Meng et al. (2013), and Meniago et al. (2013). However, this result is supported by the theoretical assumption of permanent income hypothesis (PHI) (Friedman, 1957) in explaining the trend in household borrowing after the 2008 financial crisis. According to the Euler equation, utility is maximised by households by levelling the consumption path relative to their life cycle (Debelle, 2004). When earnings are relatively substandard, households will borrow to finance current consumption or deleverage debt holding backed by an asset. This shows that household debt is dependent on household income. The finding also indicates that households burdened with high debt are vulnerable to income shock during a crisis. Besides, the higher the debt held by an individual, the lower is the household saving, which increases the household's vulnerability and may contribute to macroeconomic fallout (Fatoki, 2015). When households are vulnerable to job loss, rising interest rates, and lower future income, these macroeconomic shocks can crash the financial markets due to high non-performing loans (Debelle, 2004).

4.3.3 RO3: Financial Development in the Household Debt Model

The results presented in columns 5a–5f of Table 4.21 demonstrate the estimation analysis for RO3 following Equation 3.28 based on LSDVC AH, AB, and BB. As shown in the table, the p-value statistic of lagged household debt for the LSDVC estimator is statistically significant, suggesting that household debt is persistent. Also, the crisis dummy is positively significant, signifying that household debt accumulation will rise during a banking crisis.

The findings shows that GDP per capita and inflation have a significant negative correlation with household debt. In contrast, lending interest rate, consumption, house price, and financial development have a significant positive correlation with household debt.

Financial development is found to be the most influential factor leading to the household debt. The coefficients of financial development are 0.702, 0.692, 0.746, 0.746, and 0.73 and positively significant, implying that a country with sound financial system support contributes to an increase in the household debt. The economic interpretation of these coefficients is that a 1% increase in financial development boosts the growth rates of household debt by 0.702%, 0.692%, 0.746%, 0.746%, and 0.738% as shown in columns 5a to 5f, respectively. This result is consistent with the literature and supports that financial development plays a crucial role in encouraging household borrowings (Debelle, 2006; Mendoza & Terrones, 2008; Wolswijk, 2006; Orlowski, 2015; Kim et al. (2014). Scholars have also highlighted that competition among financial institutions during an economic expansion encourages active lending with different kinds of attractive scheme, such as eased liquidity constraint and financial liberalisation. Also, major central banks might inject

liquidity into the financial market (Barba & Pivetti, 2009; IMF, 2017). Hence, the growth in household debt is reflected by active financial development.

Table 4.21: LSDVC Analysis: Financial Development and Household Debt

Independent variables	LSDVC			LSDVC (with Crisis Dummy)		
	AH	AB	BB	AH	AB	BB
	5a	5b	5c	5d	5e	5f
FD	0.702***	0.702***	0.692***	0.746***	0.746***	0.738***
	(0.104)	(0.103)	(0.124)	(0.101)	(0.099)	(0.12)
LAG.HD	0.387***	0.386***	0.422***	0.382***	0.380***	0.413***
	(0.039)	(0.039)	(0.042)	(0.037)	(0.037)	(0.041)
GDPPC	-0.239*	-0.238*	-0.272*	-0.266**	-0.263**	-0.293**
	(0.123)	(0.122)	(0.147)	(0.121)	(0.119)	(0.143)
UN	-0.015	-0.015	-0.015	-0.017	-0.017	-0.017
	(0.04)	(0.039)	(0.047)	(0.039)	(0.038)	(0.046)
WPOP	0.143	0.141	0.233	0.334	0.328	0.405
	(0.525)	(0.523)	(0.63)	(0.514)	(0.508)	(0.614)
INF	-0.082***	-0.082***	-0.079***	-0.076***	-0.076***	-0.074***
	(0.018)	(0.018)	(0.022)	(0.017)	(0.017)	(0.021)
LIR	0.061*	0.061*	0.053	0.042	0.042	0.035
	(0.033)	(0.033)	(0.039)	(0.033)	(0.032)	(0.039)
CON	0.402**	0.401**	0.399	0.377*	0.376*	0.374
	(0.203)	(0.202)	(0.243)	(0.199)	(0.197)	(0.237)
HPI	0.395***	0.395***	0.392***	0.352***	0.352***	0.350***
	(0.05)	(0.05)	(0.061)	(0.048)	(0.048)	(0.058)
CRISIS				0.397***	0.397***	0.390***
				(0.109)	(0.107)	(0.132)
Obs	187	187	187	187	187	187
N	41	41	41	41	41	41

Notes: HD = household debt (as dependent variable), FD = financial development, GDPPC = Gross domestic product per capita, UN = unemployment, WPOP = working population, INF = inflation, LIR = lending interest rate, CON = household consumption, HPI = real house price index, and CRISIS = banking crises. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

On the other hand, countries with developed integrated system support for financial institutions and financial markets in terms of depth, access, and efficiency reflect the capacity to control and manage the moral hazard and risk efficiency, which eventually boosts households' confidence and makes it easier for households to obtain financing. The easier people can access financial institutions, the more financing they can get. Financial access means the ability of individuals and companies to access financial services (Svirydzenka, 2016). In this regard, growth in household debt could represent greater access to consumer credit offered by financial institutions (Debelle, 2004; Kang & Ma, 2009). Thus, the result proves the positive relationship between financial development and household debt.

When the model is extended to include financial development, the coefficients of GDP per capita stand between −0.238 and −0.293 and are statistically significant at 5% and 10% confidence levels in all columns. A 1% increase in GDP per capita leads to a decrease in household debt by 0.238% to 0.293%. This result is consistent with Rubaszek and Serwa (2013), which explained the life-cycle profiles of income and budget constraints. The study postulates that when income is relatively low, individuals take out loans as they expect that their income will increase in the future. Consequently, the proportion of the population with a non-positive financial position is high. In this situation, individuals will accumulate financial assets to protect against the anticipated income decrease in the retirement period. Hence, negative income (GDP per capita) boosts household debt.

The coefficients of inflation, lending interest rate, consumption, and house prices are consistent with previous findings (baseline model in Table 4.20). The coefficients of inflation are −0.082, −0.082, 0.079, −0.076, −0.076, and −0.074 (in columns 5a–5f) and

negatively significant. This result means a 1% increase in inflation causes a reduction in household debt by 0.082%, 0.082%, 0.079%, 0.076%, 0.076%, and 0.074%, respectively. The lending interest rate is positively significant, as shown in columns 5a and 5b. The coefficients of lending interest rate are 0.061 in AH and AB LSDVC estimators, suggesting that a 1% increase in the lending interest rate increases the household debt of investigated countries by 0.061%. The magnitudes of consumption in the LSDVC estimation are 0.402, 0.401, 0.377, and 0.376 and positively significant (in columns AH and AB for both models). The relationship between consumption and household debt is positive, indicating a 1% increase in consumption encourages households to take up more loans by about 0.402%, 0.401%, 0.377%, and 0.376%. The coefficients of house price are between 0.35 and 0.395 and positively significant. The result suggests a 1% increase in house prices increases household borrowings by 0.35% to 0.395%.

The finding fills the existing gaps in the literature. This study has demonstrated that financial development is a pivotal factor that influences the rapid increase in household debt. The lack of empirical evidence on the financial development as catalysts to the rising household debt is what forms part of the motivation for this study. The coefficients of other determinants of household debt, as reported in the table, are mostly consistent with theory and the baseline model.

4.3.4 **Further Analysis of the Household Debt Model**

In this section, the study performs further analysis to ensure credence to the empirical conclusion. The steps include (i) splitting the sample into two subsamples comprising advanced economies (Table 4.22) and emerging economies (Table 4.23), ii) using alternative measures for financial development (Table 4.24), iii) performing regression with Cooks'D (Table 4.25), iv) using alternative estimation methods, namely first-difference GMM estimator (Table 4.26) and system GMM estimator (Table 4.27).

First, the study divided the sample into advanced and emerging economies, as depicted in Tables 4.22 and 4.23, respectively. By dividing the sample, the study could establish robust evidence of the impact of macroeconomic variables on the changes in household debt, as well as examine whether the positive relationship represents the real relationship between financial development and household debt for both groups of economies. The results for house price and consumption on household debt for both advanced and emerging economies are statistically positive and consistent in all models. In addition, the coefficient for income (GDP per capita) is negative and statistically significant for advanced economies but insignificant for emerging economies.

For the lending interest rate, the results reveal a negative and significant relationship for advanced economies. These results explain why the estimated coefficients in Tables 4.20 and 4.21 have a weak positive sign and are mostly insignificant throughout the models. Hence, the negative relationship between the lending interest rate and household debt in advanced countries pictures particularly the US's scenario before the 2008 Global Financial Crisis in which the tremendous increase in household debt was associated with low interest rates as reported by the previous studies of Barnes and Young (2003) and Turinetti and

Zhuang (2011). In contrast, the effect of lending interest rates on household debt in emerging economies changes to positive and statistically significant at the 5% confidence level. The discussion extrapolates that the positive sign implies that higher interest rates are correlated with more borrowings in these countries. This finding indicates that the positive associations of interest rate and consumer spending with higher household debt levels in a well performing economy are more relevant to the emerging economies, as the fundamentals in these economies are stronger and the policy frameworks are generally more resilient than in the past (IMF, 2019).

The results for both sub-samples reveal a positive and significant (at the 5% significance level) effect of financial development on household debt. In addition, the coefficients of financial development for emerging economies are stronger in comparison to advanced economies. Intuitively, the evidence of a positive effect of financial development on household debt is more pronounced for emerging economies, reflecting the reliance of countries on financial development. Financial development is more important in attracting more capital inflows, boosting the stock market and private credit in Asia, and accelerating household debt in emerging Europe (Karwowski & Stockhammer, 2017).

Second, the robustness of the results was assessed by employing alternative measures for financial development. An increase in debt is better explained as a process of financial deepening or widening of access to consumer credit along with the macroeconomic factors. Financial deepening also signifies growth in deposits at financial institutions, resulting in a significant increase in household debt (Kim et al., 2017). Thus, liquid liability (LL) and private credit by deposit money banks (PCDM) were employed as substitute proxies for

financial development to determine the robustness of the study's results, as presented in Table 4.24 (columns 6a–6l).

The results of the estimations of liquid liability are presented in columns 6a to 6f and private credit in columns 6g to 6l. The results show that the coefficients of liquid liability and private credit stability remain positive and support the pivotal role of financial institutions in influencing the changes in household debt. Compared to financial development, the coefficients of liquid liability and private credit are much lower. Regarding the macroeconomic determinants, household debt is consistently negatively affected by unemployment and inflation, while positively related with household consumption and house prices.

Third, the model was tested by removing the outliers using Cooks'D. The results are reported in Table 4.25. In line with previous findings in Tables 4.20 to 4.21 pertaining to the macroeconomic effects, household debt is negatively affected by inflation but positively related with house prices. However, the effects of income, unemployment, and household consumption are not consistent. Again, the results provide further evidence for the role of financial development in determining the stock of household debt remains robust and consistent.

Finally, Tables 4.26 and 4.27 summarise the results of regressions by employing first-difference GMM and system GMM estimators developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) to determine the robustness of the study's results. In the empirical implementation, the study adjusted the two-step GMM standard errors for finite sample based on Windmeijer (2005) and adopted Roodman's (2009) suggestion in collapsing the instruments to keep the number of instruments below

the number of cross-sectional units. Two specification tests were conducted to observe whether both difference GMM and system GMM estimators are consistent, namely second-order autocorrelation (AR2 p-value) and Sargan test. First, the second-order residuals are serially correlated and not significant, confirming the absence of second-order serial correlation. Second, the Sargan test of over-identifying restrictions, which identifies the overall validity of the instruments, indicates that the p-value in the Sargan test is not significant. These results suggest that the overall instruments are valid. The results further reaffirm the macroeconomic factors and financial development view for the investigated countries. The difference GMM estimation further suggests inconsistent significant statistics for GDP, unemployment, and working population. Still, there is consistent and concrete evidence that overall, inflation, house price, and financial development play important roles in the growth of household debt.

Table 4.22: Determinants of Household Debt in Advanced Economies

Independent variable	LSDVC (No Crisis Dummy)						LSDVC (With Crisis Dummy)					
	AH	AB	BB	AH	AB	BB	AH	AB	BB	AH	AB	BB
FD				0.499***	0.502***	0.469*				0.370***	0.371***	0.350**
				(0.141)	(0.133)	(0.257)				(0.115)	(0.111)	(0.178)
LAG.HD	0.712***	0.603***	0.966***	0.602***	0.583***	0.961***	0.573***	0.549***	0.715***	0.556***	0.539***	0.757***
	(0.110)	(0.068)	(0.161)	(0.092)	(0.067)	(0.160)	(0.068)	(0.056)	(0.101)	(0.062)	(0.056)	(0.129)
GDPPC	-0.635**	-0.616**	-0.503	-0.549**	-0.541**	-0.399	-0.642***	-0.615***	-0.688***	-0.831***	-0.811***	-0.901***
	(0.318)	(0.263)	(0.384)	(0.258)	(0.247)	(0.379)	(0.192)	(0.175)	(0.241)	(0.175)	(0.168)	(0.248)
UN	-0.147*	-0.127**	-0.110	-0.055	-0.052	-0.042	-0.013	-0.004	-0.024	-0.067	-0.063	-0.069
	(0.075)	(0.064)	(0.097)	(0.067)	(0.063)	(0.093)	(0.067)	(0.062)	(0.082)	(0.067)	(0.065)	(0.094)
WPOP	0.178	0.169	-0.205	0.411	0.407	-0.024	0.916	0.898	1.200	0.767	0.745	1.134
	(0.870)	(0.699)	(1.135)	(0.695)	(0.664)	(1.141)	(0.685)	(0.626)	(0.880)	(0.613)	(0.594)	(0.909)
LIR	-0.104***	-0.083**	-0.120**	-0.091***	-0.086***	-0.125**	-0.026	-0.024	-0.020	-0.063**	-0.061**	-0.054
	(0.038)	(0.033)	(0.052)	(0.033)	(0.031)	(0.051)	(0.029)	(0.027)	(0.037)	(0.025)	(0.024)	(0.038)
INF	-0.047	-0.060**	-0.014	-0.038	-0.041	0.005	0.006	0.000	0.031	-0.022	-0.025	0.011
	(0.034)	(0.029)	(0.053)	(0.026)	(0.026)	(0.051)	(0.027)	(0.024)	(0.037)	(0.026)	(0.024)	(0.039)
CON	1.090***	1.040***	1.101***	0.991***	0.981***	1.056***	1.001***	0.994***	0.971***	0.917***	0.913***	0.875***
	(0.284)	(0.236)	(0.348)	(0.229)	(0.218)	(0.355)	(0.262)	(0.239)	(0.328)	(0.233)	(0.225)	(0.339)
HPI	0.414***	0.433***	0.362***	0.374***	0.377***	0.303***	0.383***	0.393***	0.314***	0.389***	0.395***	0.301***
	(0.070)	(0.055)	(0.117)	(0.056)	(0.053)	(0.114)	(0.061)	(0.056)	(0.081)	(0.052)	(0.050)	(0.092)
CRISIS							0.331***	0.328***	0.352**	0.203*	0.203*	0.199
							(0.101)	(0.094)	(0.149)	(0.120)	(0.116)	(0.199)
Obs	121	121	121	121	121	121	121	121	121	121	121	121
N	22	22	22	22	22	22	22	22	22	22	22	22

***Notes*:** HD = household debt (as dependent variable), GDPPC = Gross domestic product per capita, UN = unemployment, WPOP = working population, INF = inflation, LIR = lending interest rate, CON = household consumption, HPI = real house price index, CRISIS = banking crises, Obs= observation, and N = cross-section. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.23: Determinants of Household Debt in Emerging Economies

Independent variable	LSDVC (No Crisis Dummy)						LSDVC (With Crisis Dummy)					
	AH	AB	BB	AH	AB	BB	AH	AB	BB	AH	AB	BB
FD				0.967***	0.968***	0.980**				0.961***	0.963***	0.970***
				(0.241)	(0.234)	(0.438)				(0.245)	(0.235)	(0.375)
LAG.HD	0.358***	0.357***	0.392***	0.327***	0.326***	0.441***	0.350***	0.348***	0.443***	0.339***	0.337***	0.411***
	(0.070)	(0.065)	(0.071)	(0.060)	(0.039)	(0.089)	(0.090)	(0.056)	(0.081)	(0.055)	(0.043)	(0.068)
GDPPC	-0.034	-0.032	-0.105	-0.032	-0.030	-0.335	0.127	0.132	-0.111	-0.038	-0.035	-0.223
	(0.234)	(0.222)	(0.274)	(0.212)	(0.161)	(0.293)	(0.280)	(0.179)	(0.282)	(0.198)	(0.162)	(0.262)
UN	-0.171*	-0.170**	-0.178*	-0.068	-0.068	-0.080	-0.236***	-0.236***	-0.266**	-0.078	-0.078	-0.097
	(0.088)	(0.086)	(0.106)	(0.073)	(0.068)	(0.128)	(0.090)	(0.076)	(0.113)	(0.071)	(0.065)	(0.105)
WPOP	1.008	1.000	1.132	-0.529	-0.540	0.263	2.000	1.989*	2.613	-0.345	-0.360	0.159
	(1.286)	(1.258)	(1.555)	(1.099)	(1.058)	(1.998)	(1.294)	(1.201)	(1.761)	(1.112)	(1.051)	(1.702)
LIR	0.374***	0.373***	0.372***	0.354***	0.354***	0.362***	0.311***	0.311***	0.301**	0.321***	0.321***	0.309***
	(0.090)	(0.088)	(0.108)	(0.060)	(0.057)	(0.107)	(0.093)	(0.090)	(0.130)	(0.073)	(0.070)	(0.113)
INF	-0.158***	-0.158***	-0.162***	-0.109***	-0.109***	-0.114**	-0.134***	-0.134***	-0.141**	-0.107***	-0.107***	-0.111**
	(0.043)	(0.042)	(0.052)	(0.031)	(0.029)	(0.056)	(0.042)	(0.039)	(0.057)	(0.031)	(0.030)	(0.048)
CON	0.165	0.167	0.116	-0.438	-0.438	-0.604	0.122	0.123	0.013	-0.346	-0.347	-0.416
	(0.404)	(0.394)	(0.486)	(0.350)	(0.341)	(0.678)	(0.438)	(0.415)	(0.627)	(0.357)	(0.342)	(0.567)
HPI	0.392***	0.390***	0.434***	0.512***	0.511***	0.600***	0.314*	0.313**	0.369*	0.466***	0.466***	0.500***
	(0.150)	(0.145)	(0.168)	(0.123)	(0.107)	(0.203)	(0.160)	(0.133)	(0.193)	(0.125)	(0.113)	(0.181)
CRISIS							0.407	0.401	0.595	0.319	0.315	0.486
							(0.483)	(0.470)	(0.653)	(0.371)	(0.364)	(0.578)
Obs	66	66	66	66	66	66	66	66	66	66	66	66
N	19	19	19	19	19	19	19	19	19	19	19	19

***Notes*:** HD = household debt (as dependent variable), GDPPC = Gross domestic product per capita, UN = unemployment, WPOP = working population, INF = inflation, LIR = lending interest rate, CON = household consumption, HPI = real house price index, CRISIS = banking crises, Obs= observation, and N = cross-section. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.24: Alternative Measures for Financial Development

Independent variables	With Liquid Liability						With Private Credit					
	AH (6a)	AB (6b)	BB (6c)	AH (6d)	AB(6e)	BB (6f)	AH (6g)	AB (6h)	BB (6i)	AH (6j)	AB (6k)	BB (6l)
LL	0.061	0.113***	0.120***	0.088	0.101***	0.104***						
	(0.075)	(0.035)	(0.041)	(0.117)	(0.034)	(0.04)						
PCDM							0.169***	0.171***	0.170***	0.162***	0.164***	0.163***
							(0.035)	(0.033)	(0.038)	(0.035)	(0.034)	(0.039)
LAG.HD	0.787***	0.387***	0.450***	0.372***	0.400***	0.464***	0.355***	0.348***	0.363***	0.355***	0.348***	0.363***
	(0.13)	(0.04)	(0.049)	(0.133)	(0.039)	(0.048)	(0.037)	(0.036)	(0.038)	(0.037)	(0.036)	(0.038)
GDPPC	-1.135***	-0.003	-0.094	-0.152	-0.027	-0.12	-0.11	-0.099	-0.117	-0.128	-0.116	-0.134
	(0.326)	(0.124)	(0.151)	(0.365)	(0.12)	(0.149)	(0.129)	(0.125)	(0.143)	(0.13)	(0.126)	(0.145)
UN	-0.237**	-0.088**	-0.090*	-0.097	-0.096**	-0.102**	-0.107***	-0.106***	-0.107**	-0.111***	-0.111***	-0.112***
	(0.107)	(0.044)	(0.052)	(0.158)	(0.043)	(0.051)	(0.038)	(0.037)	(0.042)	(0.038)	(0.037)	(0.042)
WPOP	2.583*	0.036	0.197	1.055	0.273	0.444	0.616	0.606	0.638	0.742	0.727	0.758
	(1.468)	(0.599)	(0.718)	(2.104)	(0.582)	(0.71)	(0.562)	(0.542)	(0.617)	(0.559)	(0.54)	(0.617)
INF	-0.083**	-0.109***	-0.101***	-0.141**	-0.109***	-0.100***	-0.095***	-0.096***	-0.094***	-0.094***	-0.094***	-0.092***
	(0.041)	(0.019)	(0.023)	(0.065)	(0.019)	(0.023)	(0.019)	(0.018)	(0.021)	(0.019)	(0.018)	(0.02)
LIR	0.085	0.053	0.048	0.071	0.03	0.024	0.044	0.044	0.042	0.034	0.035	0.033
	(0.077)	(0.035)	(0.04)	(0.117)	(0.035)	(0.041)	(0.037)	(0.036)	(0.04)	(0.037)	(0.036)	(0.04)
CON	-0.005	0.495*	0.49	0.268	0.507**	0.501*	0.575***	0.574***	0.577**	0.562***	0.562***	0.565**
	(0.538)	(0.255)	(0.301)	(0.863)	(0.248)	(0.298)	(0.216)	(0.208)	(0.236)	(0.214)	(0.207)	(0.236)
HPI	0.716***	0.452***	0.445***	0.530**	0.413***	0.405***	0.289***	0.286***	0.287***	0.270***	0.268***	0.269***
	(0.128)	(0.058)	(0.068)	(0.206)	(0.056)	(0.067)	(0.059)	(0.057)	(0.065)	(0.057)	(0.055)	(0.063)
CRISIS				0.3	0.362***	0.393**				0.235**	0.230**	0.226*
				(0.419)	(0.129)	(0.16)				(0.119)	(0.115)	(0.132)
Obs	187	187	187	187	187	187	187	187	187	187	187	187
N	41	41	41	41	41	41	41	41	41	41	41	41

***Notes*:** HD = household debt (as dependent variable), GDPPC = Gross domestic product per capita, UN = unemployment, WPOP = working population, INF = inflation, LIR = lending interest rate, CON = household consumption, HPI = real house price index, CRISIS = banking crises, LL = liquid liability, PCDM = private credit deposit money by banks, Obs= observation, and N = cross-section. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.25: Results After Removing Outliers Using Cooks'D

Independent variable	Baseline			With FD			With LL			With PCM		
	AH	AB	BB	AH	AB	BB	AH	AB	BB	AH	AB	BB
FD				0.407***	0.402***	0.410***						
				(0.093)	(0.074)	(0.08)						
LL							0.126***	0.122***	0.131***			
							(0.039)	(0.031)	(0.042)			
PCDM										0.167***	0.173***	0.152***
										(0.039)	(0.034)	(0.052)
LAG.HD	0.601***	0.587***	0.764***	0.537***	0.524***	0.581***	0.428***	0.390***	0.477***	0.371***	0.340***	0.489***
	(0.084)	(0.073)	(0.089)	(0.091)	(0.056)	(0.065)	(0.092)	(0.059)	(0.08)	(0.05)	(0.039)	(0.067)
GDPPC	0.016	0.03	0.003	-0.22	-0.201*	-0.254**	-0.066	-0.008	-0.129	-0.232	-0.207	-0.27
	(0.164)	(0.156)	(0.19)	(0.159)	(0.111)	(0.129)	(0.177)	(0.139)	(0.187)	(0.224)	(0.196)	(0.291)
UN	-0.087*	-0.082*	-0.087	-0.031	-0.029	-0.033	-0.056	-0.05	-0.052	-0.079*	-0.078*	-0.072
	(0.051)	(0.048)	(0.057)	(0.049)	(0.042)	(0.049)	(0.059)	(0.047)	(0.063)	(0.047)	(0.041)	(0.062)
WPOP	0.15	0.146	0.294	0.567	0.558	0.759	0.235	0.1	0.37	0.672	0.635	0.782
	(0.671)	(0.635)	(0.749)	(0.638)	(0.549)	(0.608)	(1.053)	(0.939)	(1.237)	(0.866)	(0.754)	(1.116)
INF	-0.061***	-0.063***	-0.045*	-0.027	-0.029*	-0.022	-0.083***	-0.091***	-0.077**	-0.071***	-0.074***	-0.062*
	(0.02)	(0.018)	(0.024)	(0.024)	(0.017)	(0.019)	(0.031)	(0.026)	(0.036)	(0.027)	(0.023)	(0.036)
LIR	-0.009	-0.006	-0.035	0.035	0.037	0.037	0.031	0.038	0.032	0.037	0.042	0.021
	(0.032)	(0.03)	(0.036)	(0.029)	(0.025)	(0.029)	(0.039)	(0.033)	(0.043)	(0.04)	(0.035)	(0.05)
CON	0.179	0.168	0.185	0.001	-0.002	-0.007	0.653***	0.631***	0.628**	0.630**	0.612***	0.665**
	(0.186)	(0.178)	(0.219)	(0.193)	(0.17)	(0.196)	(0.245)	(0.221)	(0.291)	(0.258)	(0.225)	(0.338)
HPI	0.335***	0.338***	0.301***	0.313***	0.316***	0.294***	0.450***	0.456***	0.448***	0.314***	0.308***	0.325***
	(0.071)	(0.067)	(0.08)	(0.076)	(0.064)	(0.068)	(0.063)	(0.057)	(0.072)	(0.064)	(0.056)	(0.087)
Obs	174	174	174	174	174	174	179	179	179	180	180	180
N	41	41	41	41	41	41	40	40	40	41	41	41

***Notes*:** HD = household debt (as dependent variable), GDPPC = Gross domestic product per capita, UN = unemployment, WPOP = working population, INF = inflation, LIR = lending interest rate, CON = household consumption, HPI = real house price index, CRISIS = banking crises, FD = financial development, LL = liquid liability, PCDM = private credit deposit money by banks, Obs= observation, and N = cross-section. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Table 4.26: Results in Difference GMM

Dependent variable = Household debt (HD)								
Independent variable	Baseline		With FD		With LL		With PCM	
FD			0.428***	0.413***				
			(0.018)	(0.024)				
LL					0.073***	0.086***		
					(0.008)	(0.011)		
PCDM							0.133***	0.124***
							(0.009)	(0.011)
LAG.HD	0.310***	0.328***	0.335***	0.370***	0.380***	0.391***	0.314***	0.357***
	(0.015)	(0.008)	(0.017)	(0.018)	(0.021)	(0.019)	(0.022)	(0.026)
GDPPC	0.136***	0.032	-0.116**	-0.235***	-0.092**	-0.106**	0.071	-0.070
	(0.042)	(0.049)	(0.059)	(0.055)	(0.042)	(0.041)	(0.047)	(0.057)
UN	-0.045*	-0.043*	0.022	-0.028	-0.062***	-0.086***	-0.076***	-0.074***
	(0.026)	(0.024)	(0.030)	(0.028)	(0.022)	(0.021)	(0.025)	(0.020)
WPOP	0.037	0.183	0.323	0.405	0.441**	0.534**	0.061	0.327
	(0.266)	(0.255)	(0.235)	(0.247)	(0.218)	(0.228)	(0.194)	(0.323)
INF	-0.118***	-0.115***	-0.079***	-0.083***	-0.111***	-0.111***	-0.103***	-0.096***
	(0.009)	(0.004)	(0.009)	(0.006)	(0.006)	(0.006)	(0.005)	(0.007)
LIR	0.078***	0.055***	0.078***	0.062***	0.036***	0.030***	0.019*	-0.013
	(0.007)	(0.008)	(0.008)	(0.009)	(0.008)	(0.010)	(0.011)	(0.012)
CON	0.688***	0.638***	0.647***	0.483***	0.520***	0.430***	0.578***	0.430***
	(0.068)	(0.153)	(0.083)	(0.110)	(0.124)	(0.137)	(0.094)	(0.104)
HPI	0.526***	0.503***	0.492***	0.458***	0.489***	0.472***	0.424***	0.384***
	(0.012)	(0.009)	(0.017)	(0.018)	(0.01)	(0.013)	(0.015)	(0.014)
CRISIS		0.314***		0.293***		0.165***		0.333***
		(0.028)		(0.055)		(0.037)		(0.027)
Constant	-3.885***	-3.185	-2.253*	-0.616	-2.887**	-2.747*	-2.826***	-1.797
	(1.486)	(1.936)	(1.322)	(1.464)	(1.391)	(1.520)	(1.041)	(1.725)
Obs	146	146	146	146	146	146	146	146
N	41	41	41	41	41	41	41	41
No. of instruments	41	42	42	43	43	44	42	43
AR(2) p-value	0.4703	0.5563	0.4387	0.6051	0.2879	0.3969	0.3979	0.4262
Sargan test p-value	0.5601	0.5213	0.6617	0.6789	0.7638	0.6725	0.4711	0.652

Table 4.27: Results in system GMM

Dependent variable = Household debt (HD)								
Independent variable	Baseline		With FD		With LL		With PCM	
FD			0.584***	0.466***				
			(0.079)	(0.045)				
LL					0.116***	0.117***		
					(0.009)	(0.010)		
PCDM							0.192***	0.124***
							(0.009)	(0.011)
LAG.HD	0.386***	0.405***	0.447***	0.364***	0.440***	0.444***	0.358***	0.357***
	(0.019)	(0.018)	(0.032)	(0.027)	(0.022)	(0.023)	(0.027)	(0.026)
GDPPC	0.275***	0.266***	0.036	0.183***	0.220***	0.220***	0.224***	-0.070
	(0.046)	(0.046)	(0.048)	(0.045)	(0.028)	(0.030)	(0.026)	(0.057)
UN	-0.085***	-0.071***	-0.076***	-0.053**	-0.079***	-0.078***	-0.104***	-0.074***
	(0.018)	(0.023)	(0.022)	(0.022)	(0.014)	(0.017)	(0.017)	(0.020)
WPOP	1.564***	1.650***	0.823**	0.919***	-0.118	-0.031	-0.046	0.327
	(0.232)	(0.309)	(0.404)	(0.237)	(0.305)	(0.353)	(0.320)	(0.323)
INF	-0.119***	-0.102***	-0.091***	-0.059***	-0.099***	-0.096***	-0.087***	-0.096***
	(0.008)	(0.009)	(0.011)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)
LIR	0.070***	0.065***	0.008	0.091***	0.100***	0.091***	0.042***	-0.013
	(0.016)	(0.011)	(0.024)	(0.010)	(0.010)	(0.014)	(0.015)	(0.012)
CON	0.883***	0.866***	0.530***	0.816***	0.400***	0.395***	0.254***	0.430***
	(0.113)	(0.108)	(0.147)	(0.113)	(0.097)	(0.131)	(0.077)	(0.104)
HPI	0.378***	0.374***	0.350***	0.323***	0.381***	0.372***	0.343***	0.384***
	(0.022)	(0.018)	(0.039)	(0.019)	(0.018)	(0.027)	(0.019)	(0.014)
CRISIS		0.135**		0.367***		0.239***		0.333***
		(0.066)		(0.041)		(0.050)		(0.027)
Constant	-12.047***	-12.332***	-4.544**	-7.751***	-3.291**	-3.598*	-2.700*	-1.797
	(1.390)	(1.752)	(1.895)	(1.452)	(1.609)	(1.950)	(1.427)	(1.725)
Obs	187	187	187	187	187	187	187	146
N	41	41	41	41	41	41	41	41
No. of instruments	35	37	42	37	56	57	55	43
AR(2) p-value	0.103	0.1138	0.1922	0.205	0.3682	0.4519	0.3671	0.4262
Sargan test p-value	0.1644	0.203	0.419	0.2219	0.9037	0.8804	0.8469	0.652

4.4 Household Debt and Systemic Banking Crises

The fourth objective of this study is to investigate whether household debt can serve as a predictor for systemic banking crises, following Laeven and Valencia (2013). Logit regression was used to analyse the functional form of Equation 3.29 in the logit model of for a panel dataset of 41 countries including advanced and emerging economies for the period of 1980 to 2018. Two countries were excluded from the sample, namely Argentina and Saudi Arabia, due to data unavailability. Subsection 4.4.1 summarises the descriptive statistics including the mean, minimum, and maximum values and variation over time between countries. The results of logit regression analysis are presented in subsection 4.4.2. For the robustness test, the study analysed the out-of-sample from 2001 to 2009, as discussed in subsection 4.4.3.

4.4.1 Descriptive Statistics for the Crisis Model

The variables included are systemic banking crises (CRISIS), growth of gross domestic product (GDPG), trade balance (TB), depreciation (DEP), real interest rate (RIR), inflation (INF), fiscal balance (FISCAL), financial contagion (FC), household debt (HD), and change in household debt growth (HDTG). Table 4.28 provides the descriptive summary of the systemic banking crises model. Systemic banking crises are indicated by a dummy variable, denoting the value of 0 or 1. The average GDP growth is 2.9% with the lowest value of −9.1% (Greece) and the highest value of 25% (Ireland). Trade balance has a mean of 0.78% with the lowest value of −14.7% (Portugal) and the highest value of 25.92% (Singapore). Depreciation, which stands for foreign exchange exposure, has an average value of 98.5% and ranges from 48% (Russian Federation) to 165.88% (Korea).

Furthermore, the mean of interest rate is 7%, with the lowest value of −0.55% (Finland) and the highest value of 67% (Turkey). The average value of inflation is 4.9%, with the lowest value of −6% (Malaysia) and the highest value of 143.7% (Turkey). It is not surprising that interest rate and inflation rate are very high in Turkey, as the country experienced a financial crisis in 2000–2001. Fiscal balance has a mean of −2.7% and varies from –34.32% (Portugal) to 16.27% (Singapore). Financial contagion has an average value of 81.4% with the lowest value of 14.2% (Colombia) and the highest equal of 431.4% (Luxembourg). The average value of household debt is 50.3% and the minimum and maximum values are 0.1% (Turkey) and 139.4% (Denmark), respectively.

Table 4.28: Summary Descriptive Statistics for the Systemic Banking Crises Model

Variable	Mean	Std.Dev.	Min	Max
CRISIS	.028	.165	0	1
GDPG	2.829	2.921	-9.132	25.117
TB	0.78	5.627	-14.652	25.92
DEP	98.483	14.348	47.953	165.877
RIR	6.978	7.941	-.554	67
INF	4.92	10.091	-5.992	143.693
FISCAL	-2.66	4.116	-34.315	16.267
FC	81.429	53.501	14.212	431.354
HD	50.28	29.69	0.1	139.4

Notes: CRISIS = Systemic banking crises, GDPG = growth of gross domestic product, TB = trade balance, DEP = depreciation, LIR = lending interest rate, INF = inflation, FISCAL = fiscal balance, FC = financial contagion, HD = household debt.

Table 4.29 reports the correlation analysis for all the regressions. GDP growth and trade balance are negatively correlated and statistically significant with banking crises. Meanwhile, depreciation, interest rate, inflation, fiscal balance, financial contagion, and household debt are statistically insignificant with crises. All the signs of the indicators shown in the correlation matrix are consistent with theoretical assumptions. In addition,

Table 4.30 shows that the VIF values do not exceed the cut-off point of 10 and the mean value stands at 1.5, indicating no serious collinearity problems.

Table 4.29: Correlation Matrix for the Systemic Banking Crises Model

Variables	CRISIS	GDPG	TB	DEP	RIR	INF	FISCAL	FC	HD
CRISIS	1								
GDPG	-0.111	1							
	(0.000)								
TB	-0.072	0.11	1						
	(0.018	(0.000)							
DEP	0.045	-0.03	0.058	1					
	(0.122)	(0.305)	(0.059)						
RIR	0.022	-0.029	-0.186	-0.168	1				
	(0.462)	(0.321)	(0.000)	(0.000)					
INF	0.02	0.084	-0.092	-0.287	0.575	1			
	(0.494)	(0.004)	(0.003)	(0.000)	(0.000)				
FISCAL	-0.047	0.243	0.469	0.064	-0.22	-0.079	1		
	(0.151)	(0.000)	(0.000)	(0.047)	(0.000)	(0.014)			
FC	0.021	-0.057	0.302	0.176	-0.23	-0.279	0.061	1	
	(0.501)	(0.067)	(0.000)	(0.000)	(0.000)	(0.000)	(0.076)		
HD	0.039	-0.231	0.187	0.282	-0.363	-0.415	0.115	0.388	1
	(0.177)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

Notes: CRISIS = Systemic banking crises, GDPG = growth of gross domestic product, TB = trade balance, DEP = depreciation, LIR = lending interest rate, INF = inflation, FISCAL = fiscal balance, FC = financial contagion, and HD = household debt.

Table 4.30: Variance Inflation Factor for RO4

	VIF	1/VIF
GDPG	1.204	0.831
TB	1.624	0.616
DEP	1.054	0.948
RIR	2.06	0.486
INF	1.737	0.576
FISCAL	1.31	0.763
FC	1.638	0.61
HD	1.563	0.64
Mean VIF	1.5	.

Notes: CRISIS = Systemic banking crises, GDPG = growth of gross domestic product, TB = trade balance, DEP = depreciation, LIR = lending interest rate, INF = inflation, FISCAL = fiscal balance, FC = financial contagion, and HD = household debt.

4.4.2 **RO4: Household Debt and Systemic Banking Crises**

This section presents the results of household debt as an early indicator of systemic banking crisis. Table 4.31 reports the logit regression estimator for systemic banking crises with five benchmarks to measure the quality of model specifications, which are McFadden's Pseudo R2, log likelihood ratio, AIC, in-sample classification, and ROC statistics. The table also demonstrates the coefficient-log of the odds (logit), exponential of logit and its probability. As shown by the results in Table 4.31, GDP growth reduces the probability of a crisis. Meanwhile, higher depreciation, inflation, financial contagion, household debt, and change in the household debt growth increase the probability of a crisis. The estimated coefficient for the intercept is the log odds of occurrence for banking crises is zero is exp (-13.444) = 1.44992E-06. So the intercept in this model corresponds to the log odds of being in CRISES when the explanatory variables are at the hypothetical value of zero.

The sign of the core variable of this study, household debt has a positive sign with 0.022 and is statistically significant at the 5% confidence level. The coefficient for household debt is the difference in the log odds. In other words, for a 1% increase in the household debt ratio, the expected change in log odds is 0.022. It has a positive predictive power on crises, suggesting that high levels of household debt are associated with higher probabilities of a banking crisis. For every 1% change in household debt, the log odds of CRISIS (versus non-crisis) increase by 2.2% (see Table 4.31 in column probability).

Table 4.31: Logit Model for the Systemic Banking Crises Model

Independent variables	Logit (log of odds)	Exp(logit)	Probability % (1- Exp(logit))
HD	0.022**	1.022243784	2.2%
	-0.01		
HDTG(t-1)	0.048***	1.049170655	4.9%
	-0.013		
GDPG	-0.354***	0.701874967	-29.8%
	-0.09		
TB	-0.098	0.906648904	-9.3%
	-0.06		
DEP	0.076***	1.078962574	7.9%
	-0.022		
RIR	-0.138	0.871098692	-12.9%
	-0.113		
INF	0.185*	1.20321844	20.3%
	-0.1		
FISCAL	0.035	1.035619709	3.6%
	-0.087		
FC	0.007*	1.007024557	0.7%
	-0.004		
Constant	-13.444***	1.44992E-06	-100.0%
	-2.609		
N	664		
Pseudo R2	0.2648		
Log-Likelihood	49.38***		
AIC	157.073		
ROC Statistics	0.7914		
Total correct	13		
% crises correct	61.9		
% no crises correct	85.09		
% total correct	84.36		

***Notes*:** CRISIS = Systemic banking crises (as dependent variable), GDPG = growth of gross domestic product, TB = trade balance, DEP = depreciation, LIR = lending interest rate, INF = inflation, FISCAL = fiscal balance, FC = financial contagion, HD = household debt, and HDTG = change in household debt growth. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

Similarly, the HDTG(t-1) has a positive sign with 0.048 and is statistically significant at the 1% confidence level. It has a positive predictive power on crises, suggesting that high levels of HDTG(t-1) are associated with higher probabilities of a banking crisis. For every 1% change in HDTG(t-1), the log odds of CRISIS (versus non-crisis) increases by 0.048. Hence, a 1% increase in the HDTG(t-1) increases the probability of CRISIS by 4.9%. This result is consistent with the findings of Mian et al. (2017) and Park et al. (2018) that an increase in household debt predicts a subsequent slowdown in the economy. In turn, the current household debts will default, further slowing down the current economic growth.

Moreover, the result is supported by Büyükkarabacak and Valev (2010) and Angeles (2015), which claimed that countries that enjoyed high levels of household debt had experienced a banking crisis. Household debt is the accumulated loans to be repaid in instalments by household borrowers with future positive incomes during periods of economic growth. Favourable financial development in credit markets, such as easy financial access and financial liberalisation, induces households to take up more loans. Consequently, credit expansion caused by long-term positive incomes allows more households to carry greater debt. However, when households realise that it is beyond their capability to pay the debt, it will lead to one or more circumstances, namely a higher interest rate, a decline in asset prices, or a negative income shock, thus precipitating a crisis. Schularick and Taylor (2012) demonstrated that a high debt level was a key determinant of the intensity of the ensuing recession and a signal of a financial crisis. Furthermore, Sufi (2012) analysed US household debt and argued that the lower income group experienced a growth in leverage and confirmed his hypothesis that the expansion in credit supply was

driven by the willingness of financial institutions to lend[17]. Aliber and Kindleberger (2017) confirmed that financial crises are usually preceded by an expansion of the financial institutions. Additionally, Demeriguc-Kunt and Detragiache (1999) confirmed that an expansion of the financial system followed by financial liberalisation increases the probability of banking crises, leading to financial crises. Thus, the rapid growth in household debt increases the probability of banking crises.

Next, the control variable, GDP growth has a value of −0.354 and is statistically significant at the 1% significance level. GDP growth has a negative predictive power for crises, suggesting that low GDP growth is associated with a higher probability of a banking crisis. For every 1% change in GDP growth, the log odds of CRISIS increases by 0.354. Indicating that for a 1% increase in GDP growth, lower the chances of banking crises to occur by 29.8%. The result is supported by Demirgüç-Kunt and Detragiache (1998), which claimed that the real side of economic activities has been a major source of systemic banking crises. GDP measures economic performance, and growth in GDP signifies economic expansion, low unemployment rates, high household income, and increased aggregate consumption which stimulates economic growth. In contrast, low GDP growth indicates a higher unemployment rate, negative income, reduced consumer expenditure, and in turn, economic slowdown.

Babecký et al. (2012) confirmed that banking crises cause currency crises, eventually culminating in twin crises. The results of the study show a positive value of 0.076 for

[17] There is insufficient evidence proving that the supply side (financial institutions) boosts household debt. Few papers such as Kim et al. (2014) found that the growth of household debt in Korea was partly caused by financial development. Hence, this study empirically offers new insight that financial development play an important role in influencing the household debt from the macro-panel dataset perspective, which presented in subsection 4.2.3.

currency depreciation which is statistically significant at the 1% confidence level, suggesting that a 1% depreciation in the currency increases the likelihood of a banking crisis by 7.9%. This finding supports Demirgüç-Kunt and Detragiache (1998) and Babecký et al. (2012). Currency depreciations arises in line with adverse movements in the terms of trade. During an economic boom, the local currency appreciates and then depreciates when the economy goes bust. Thus, currency depreciation, reflected in the exchange market risk, plays a pivotal role as an EWS for banking crises (Demirgüç-Kunt & Detragiache, 1998).

Inflation has a positive sign of 0.185 and is statistically significant at the 5% confidence level. For every 1% change in inflation, the log odds of CRISIS increases by 0.185, it is expected to see about 20% higher the chances of banking crises to erupt. The result denotes a higher inflation rate is likely to increase the likelihood of a banking crisis, which is in line with some previous studies (see Joy et al., 2017; Kaminsky & Reinhart, 1999). Financial liberalisation and low borrowing cost result in increased consumption, which increases the inflation of commodity prices. High inflation signals policy mismanagement, leading to higher nominal interest rates at the expense of lenders (Davis & Karim, 2008). A higher inflation rate incorporates the market risk of property price boom, thus precipitating a crisis.

Financial contagion has a positive value of 0.007 and is statistically significant at the 10% confidence level in model 1a. For every 1% change in financial contagion, the log odds of CRISIS increases by 0.007. High financial contagion appears to significantly increase the probability of a banking crisis by 1%, which is in line with the finding of Demirgüç-Kunt and Detragiache (1998). Diamond and Dybvig (1983) hypothesised that peculiar bank runs are the result of liquidity risk drives. However, high bank liquid

liabilities suggest that banks try to cover the economic loss following the non-performing loans. Financial contagion signifies bank's liquidity in adjusting to market risk exposure. Accordingly, Laeven and Valencia (2013) categorised banking crises whereby there are significant policy interventions in the banking sector, such as extensive liquidity support.

Regarding the quality of model specification, a lower AIC suggests a better fit of the model. The study obtained the AIC value of 157, which is acceptable based on Demirgüç-Kunt and Detragiache (1998). The second diagnostic test is in-sample classification as the predictive ability to accurately call crises and non-crises episodes. Table 4.31 shows the predictive power with a cut-off probability of 0.05 based on Demirgüç-Kunt and Detragiache (1998). This predictive power is interpreted as a higher total percentage of correctly calling a crisis. The model notably scores a considerably high percentage at predicting crisis events with about 84.36% of crisis episodes being called correctly, suggesting that the estimated EWS model which incorporates household debt is a fit indicator. Meanwhile, for the ROC curve, the best model is likely to approach the value of 1. In this model, the x-axis denotes sensitivity, which refers to the ability to correctly predict a crisis. In contrast, specificity refers to the ability to correctly predict non-crises. The result of this study is in line with the IMF reports and vast literature works that financial crises are partly led by the growth in household debt (Mian & Sufi, 2009; Glick & Lansing, 2010).

4.4.3 Further Analysis using Logit Regression

In this section, the study performs a robustness test to ascertain whether the empirical results remain unchanged. The study categorised the further analyses into a few segments: (i) using out-of-sample data for 2001 to 2009 (in Table 4.32 A) and ii) splitting the sample into two subsamples: advanced and emerging economies (in Table 4.32 B–C).

First, Table 4.32 A presents the results using estimates of out-of-sample data. There are several underlying reasons for using out-of-sample[18] data and countries that had experienced crises. Mian and Sufi (2015) suggested that the large increase in household debt in the mid-2000s precipitated a severe global recession. Therefore, this study regressed the models using out-of-sample data for the years 2001–2009 to see if the sub-prime episode was detectable in advance given the dramatic rise in household debt during the mid-2000s and the end of the systemic banking crisis was in 2009.

The estimated probability of household debt of 0.022 and the change in household debt growth of 0.033 remain robust and are positively significant at the 5% confidence level. The results suggest that the growth in household debt during the previous time period significantly increases the probability of a crisis, which is consistent with the earlier results. Accordingly, the subsequent accumulation of household debt (HD) heightens the probability of a crisis.

[18] Out-of-sample analysis has been employed in many studies in various ways. For example, Davis and Karim (2008) analyse from 2004 and 2005 only to forecast the consistency of their in-sample results. Whereas, Borio and Drehmann (2009) include the 2008 banking crises in their out-of-sample to investigate the banking crises from 2004 to 2008 since pressure arising from financial distress that occurred during this period. Holopainen and Sarlin (2017) run out-of-sample comparisons of several methods, but, their dataset containing a relatively small number of crisis episodes. Also, Beutel et al. (2018) conduct extensive out-of-sample model evaluations on a sample of 15 advanced economies covering 22 systemic banking crises over the period 1970-2016.

Overall, the regression results show that for the control variables, real GDP growth has a negative impact and remains robust. Meanwhile, depreciation, inflation, and financial contagion remain positive and significantly increase the probability of a systemic banking crisis, consistent with previous findings. The results are consistent with the findings of Demirgüç-Kunt and Detragiache (1998). Depreciation remains positive with a value of 0.068 and is statistically significant at the 1%. The result suggests that further depreciation in the value of foreign exchange increases the probability that a crisis will erupt. Next, inflation with a value of 0.194 remains positive and significant at the 1%. Finally, the regression result shows that financial contagion has a positive value of 0.007 and remains robust and significant.

For the quality of model specification, the likelihood test statistics show that all the coefficients are significantly different from zero. On the basis of the AIC, Model A has a value of 125.017 and is better than the model in Table 4.31. The next diagnostic test is in-sample classification to predict the ability to accurately call crisis and non-crisis episodes. Model A has an 83% likelihood of predicting crisis events correctly and the ROC curve has a value of 0.82, suggesting that the model has a high sensitivity to call a crisis correctly. Hence, the results in Model A, which incorporates household debt as an indicator of systemic banking crises, are formally consistent and robust.

Second, the sample was split into advanced and emerging economies to capture any heterogeneity effect for different characteristics of countries, as depicted in Table 4.32 (models B–C). The results for advanced economies are consistent with the findings in Table 4.31 and show that household debt is positive and has a significant predictive power preceding a crisis (model B). In contrast, household debt and changes in household debt

are statistically insignificant at predicting banking crises in emerging economies, as shown in model C. The logical explanation behind this estimation result is the list of banking crises in emerging countries for 2008 received little reporting, except for Hungary and Russia. Asian countries, in particular, were affected by the 1997 crisis. According to previous studies soon after the crisis such as Corsetti et al. (1999) which incorporated currency depreciation, investors' panic that caused capital outflows was the reason for the crisis. Consequently, Hardy and Pazarbasioglu (1999) added trade balance deterioration in the list of early warning predictors of banking crises. Moreover, Duttagupta and Cashin (2011) claimed that high annual inflation rates were among the reasons for the crisis, as demonstrated in their study on emerging and developing countries. Higher inflation may also reflect the market risk of asset price booms (Davis & Karim, 2008). Inflated house prices due to financial liberalisation incorporated the market risk. The results of this study are consistent with a recent study by Tunay et al. (2020), which argued that banking crises in emerging economies are likely caused by systemic risk with high credit default due to economic shock. Thus, the effect of household debt is more pronounced in advanced economies.

Overall, models A and B present a better model fit with considerable AIC values for both samples. Additionally, the ROC statistics are appropriate to explain the model, with the emerging economies recording higher ROC statistics. Regarding the specificity of correctly calling a crisis and non-crisis, advanced economies obtained a higher percentage of 63% while emerging economies reported a slightly lower percentage of 60% but still within the range suggested by Demirgüç-Kunt and Detragiache (1998). The result

demonstrates that the EWS with household debt better explains the banking crises in advanced economies.

Table 4.32: Logit Model for Systemic Banking Crises: Robustness Test

	Out-of-sample			Advanced economies			Emerging economies		
	A			B			C		
Independent variables	**Coefficient**	**Exp(coefficient)**	**Probability**	**Coefficient**	**Exp(coefficient)**	**Probability**	**Coefficient**	**Exp(coefficient)**	**Probability**
GDPG	-0.270***	0.763379494	-24%	-0.299***	0.741559409	-26%	-0.218	0.804125442	-20%
	-0.102			-0.1			-0.189		
TB	-0.058	0.943649947	-6%	-0.032	0.968506582	-3%	-0.287*	0.750511729	-25%
	-0.055			-0.052			-0.173		
DEP	0.068**	1.070365308	7%	0.041*	1.041852106	4%	0.043	1.043937895	4%
	-0.028			-0.024			-0.032		
RIR	-0.02	0.980198673	-2%	-0.01	0.990049834	-1%	-0.025	0.975309912	-2%
	-0.057			-0.099			-0.048		
INF	0.194*	1.214096283	21%	0.034	1.034584607	3%	0.196***	1.216526905	22%
	-0.108			-0.139			-0.071		
FISCAL	-0.02	0.980198673	-2%	-0.037	0.963676135	-4%	0.176	1.192438059	19%
	-0.09			-0.083			-0.255		
FC	0.007*	1.007024557	1%	0.007	1.007024557	1%	0.005	1.005012521	1%
	-0.004			-0.004			-0.027		
HD	0.022**	1.022243784	2%	0.019*	1.019181649	2%	0.043	1.043937895	4%
	-0.011			-0.011			-0.039		
LAG HDTG	0.033**	1.033550539	3%	0.068***	1.070365308	7%	-0.006	0.994017964	-1%
	-1.44			-0.019			-0.017		
Constant	-12.677***	3.12211E-06	-100%	-10.162***	3.861E-05	-100%	-10.401**	3.04021E-05	-100%
	-3.407			-3.01			-4.136		
N	279			482			281		
Pseudo R2	0.2133			0.2166			0.0822		

Log-Likelihood	28.47***			34.68***			15.33**		
AIC	125.0168			145.4368			54.86826		
ROC statistics	0.8282			0.8343			0.9254		
Total correct	18			19			5		
% crises correct	83.33			63.16			60		
% no crises correct	67.82			82.07			94.57		
% total correct	68.82			81.33			93.95		

Notes: CRISIS = Systemic banking crises (as dependent variable), GDPG = growth of gross domestic product, TB = trade balance, DEP = depreciation, LIR = lending interest rate, INF = inflation, FISCAL = fiscal balance, FC = financial contagion, HD = household debt, and HDTG = change in household debt growth. Significance level: *** p<0.01, ** p<0.05, * p<0.10. Significance level: *** p<0.01, ** p<0.05, * p<0.10, in which the null hypothesis is rejected. Standard error is in the parentheses ().

4.5 Discussion

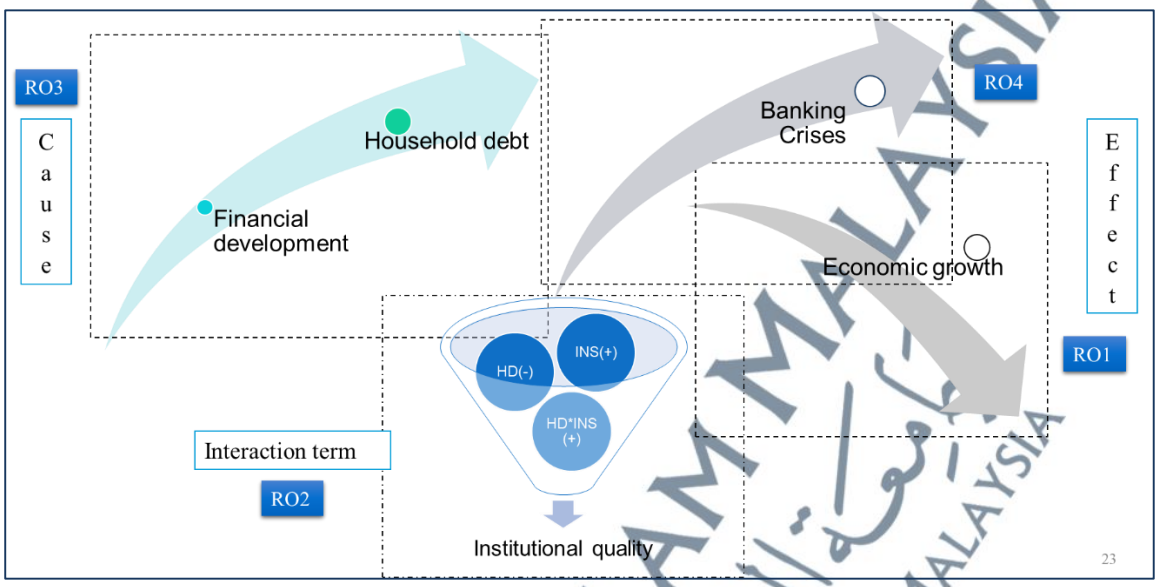

Figure 4.3: Summarise results

Overall, the analysis answered the main objective to identify the causes and effects of household debt-growth nexus in four research questions. The empirical findings show that financial development plays an important role in influencing the rising household debt. Eventually, it heightened the probability of banking crises and caused a negative effect on economic growth. In the middle, institutional quality plays a conditional role in lessening the negative impact of rising household debt on economic growth.

The results remain robust and consistent for different specification analyses and estimation methods, albeit a few other findings need to be highlighted. The result of rising household debt has a negative effect on growth remain consistent for advanced economies and emerging economies, but the results for emerging economies are insignificant when interaction term is included based on the split sample analysis. Moreover, the coefficient for institutional quality is positive but insignificant for emerging economies.

The logical reason behind these findings is the household debt in emerging economies is rising but still small comparing to advanced economies reflecting a higher prevalence of financial frictions that reduce households' access to debt (IMF, 2017). The rising of household debt may be slow down the growth in emerging economies. Still, Koong et al. (2017) found that rising household debt may not negatively influence financial stability. So, the diverse countries' characteristics may contribute to different empirical findings and require suitable policy implications.

On the other spectrum, the major findings support Shariah principles, which emphasized that the borrowings are not supported in Islamic teaching. The reason for "dayn" or known as debt, is discouraged because once the debt has not been managed carefully, it could lead to calamity to the borrower and lender as well. Interestingly, the sample countries with a Muslim majority, such as Indonesia, Malaysia, Saudi Arabia, and Turkey, are still at a lower level ratio of household debt except for Malaysia, as depicted in Figure 11. Although there is a lack of evidence showing that household debt causes the slowdown in economic growth for these countries, the increasing household debt in Malaysia should be taken seriously by the authority in considering careful debt management in any unexpected economic shock the unforeseen risk.

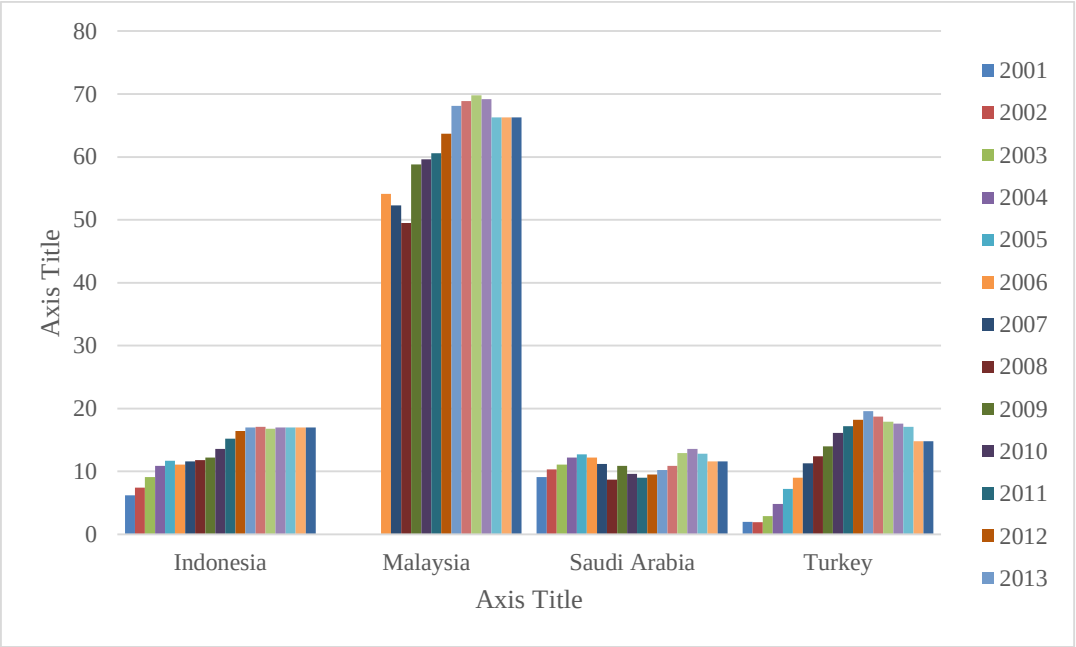

Figure 4.4: Household debt trend in Muslim majority countries

4.6 Summary of Findings

This chapter presents the empirical findings obtained from the LSDVC estimation method and logit regression models to attain the objectives of the study for a panel data sample on 43 countries (for RO1 and RO2) and 41 countries (for RO3 and RO4) covering the period of 1980–2018. Four main empirical findings for each of the research objectives have been discussed in each section of this chapter. The first objective is to examine the effect of household debt on growth, and the second objective aims to investigate the influence of institutional quality in the household debt-growth model. Using LSDVC estimators, the results show that household debt alone is negatively significant in influencing the output growth, while higher institutional quality boosts growth. Additionally, the results show that the negative effect of household debt is moderated when institutional quality is included in the growth model. The third objective is to examine the role of financial development as one of the important factors for the rising household debt,

using LSDVC estimators. The results demonstrate that financial development has a significant effect on household debt. Meanwhile, the fourth objective is to examine the probability of household debt serving as an indicator of an early warning signal (EWS) for systemic banking crises, using logit regression. The findings are remarkable and confirm that household debt is positive and significant as an indicator in the EWS for systemic banking crises. The study extended the analyses by removing outliers, regressing the advanced and emerging economies in two different subsamples, using alternative proxies for RO3, and employing GMM as an alternative estimator. While the main results are based on LSDVC methods and demonstrated that the use of the GMM estimator did not affect results' conclusions. This ruled out potential problems of endogeneity among the explanatory variables, as tests showed that these variables can be treated as exogenous, providing further support for the empirical approach followed throughout the paper. The findings of the robustness test confirm the earlier results, which are robust and consistent.