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RELATIONSHIP BETWEEN HOUSEHOLD DEBT AND INCOME INEQUALITY: TVP-VAR APPROACH

Supanee Harnphattananusorn[1]

Abstract

This study examines the connection between household debt and income disparity in Thailand, emphasizing the dynamic interaction between these two variables. The study utilizes annual data from 1980 to 2022, a period marked by significant structural changes in the economy. To address these changes, the study implements the Time-Varying Parameter Vector Autoregression (TVP-VAR) estimation method, which is well-suited for capturing dynamic structural shifts. After estimating the model, coefficients were used to generate the impulse response function. The results of the study indicate that a one standard deviation shock in income inequality, as measured by the Gini coefficient, results in a reduction in the household debt-to-GDP ratio across the short, medium, and long term, with the impact being most pronounced in the short term and diminishing over time. Furthermore, the study examines how a shock to income inequality influences consumption patterns. An increase in the Gini coefficient initially leads to a rise in short-term consumption, but this effect reverses in the medium and long term, when consumption declines. The study also explores the impact of household debt shock on consumption. The results indicate that an increase in the debt-to-GDP ratio is associated with a rise in short-term consumption, while in the medium and long term, consumption decreases. These findings highlight the complex and varying impacts of income inequality and household debt on economic indicators over different time horizons, emphasizing the importance of accounting for dynamic structural changes in economic analysis.

Keywords: Household Debt, Income Inequality, TVP-VAR, Thailand

1. INTRODUCTION

Thailand has achieved remarkable success in lowering poverty rates, dropping from 58% in 1990 to 6.8% in 2020 (WDI). This improvement has been driven by robust economic expansion and structural reforms. However, 79 percent of the poor still live in rural areas, mostly working in the agricultural sector, which contributes to income inequality. Income inequality refers to the concentration of income among certain groups. When measuring inequality in income, various indicators can be used, such as the Gini coefficient, Generalized Entropy index, Atkinson's index, and the Theil index. Each of these indicators has its own advantages and disadvantages, depending on the context and purpose of the analysis. According to World Bank standards, income inequality is commonly assessed using the Gini index. The Gini index has two types: 1) based on income and 2) based on expenditure. The Gini index measures inequality on a scale from 0 to 1. A value near 0 reflects a more equitable distribution of spending or income, while a value closer to 1 indicates greater inequality.

Data from the National Statistics Office, shown in Table 1, indicates that using

[1] Assoc. Prof Dr. Supanee Harnphattananusorn is currently working as a lecturer in the Faculty of Economics of Kasetsart University, Thailand. She obtained a Ph.D. in Economics from Thammasat University, Thailand. Email: supanee.h@ku.th

Thailand's Gini coefficient data from 1988 to 2023, reveals that income inequality has not significantly improved over time. In 1988, the nationwide Gini coefficient was 0.49 compared to 0.42 in 2023, indicating that after more than 60 years, income inequality remains a persistent issue in Thailand. Income inequality often creates unequal opportunities, as individuals from lower-income families frequently face restricted access to quality education, healthcare, and stable employment. This limits their ability to improve their socioeconomic status and make significant contributions to the economy over time. Such disparities can lead to a loss of potential talent and innovation, as large segments of the population are unable to reach their full potential. Furthermore, high income inequality exacerbates social tensions, reduces social mobility, and generates economic inefficiencies.

Table 1 Gini Coefficient of Thailand by Region

Year	Whole Kingdom	Bangkok	Central Region	Northern Region	Northeastern Region	Southern Region	Municipal area	Non-municipal area
1988	0.49	0.39	0.44	0.44	0.45	0.46	0.43	0.44
1990	0.51	0.42	0.48	0.47	0.43	0.47	0.48	0.45
1992	0.54	0.46	0.46	0.48	0.47	0.48	0.49	0.44
1994	0.52	0.40	0.46	0.47	0.47	0.50	0.47	0.46
1996	0.51	0.40	0.47	0.46	0.47	0.47	0.48	0.44
1998	0.51	0.41	0.44	0.47	0.46	0.49	0.47	0.45
2000	0.52	0.42	0.45	0.47	0.48	0.48	0.47	0.47
2002	0.51	0.44	0.44	0.48	0.47	0.46	0.47	0.45
2004	0.49	0.42	0.43	0.49	0.45	0.45	0.46	0.44
2006	0.51	0.46	0.44	0.47	0.51	0.48	0.48	0.48
2007	0.50	0.47	0.42	0.45	0.48	0.46	0.47	0.46
2009	0.49	0.47	0.41	0.44	0.49	0.48	0.47	0.44
2011	0.48	0.51	0.39	0.44	0.46	0.46	0.49	0.43
2013	0.46	0.45	0.40	0.43	0.44	0.44	0.45	0.45
2015	0.45	0.40	0.40	0.39	0.43	0.45	0.43	0.41
2017	0.45	0.41	0.40	0.42	0.45	0.45	0.44	0.43
2019	0.43	0.34	0.39	0.41	0.43	0.44	0.41	0.41
2021	0.43	0.37	0.39	0.40	0.42	0.43	0.42	0.41
2023	0.42	0.37	0.37	0.40	0.41	0.43	0.41	0.40

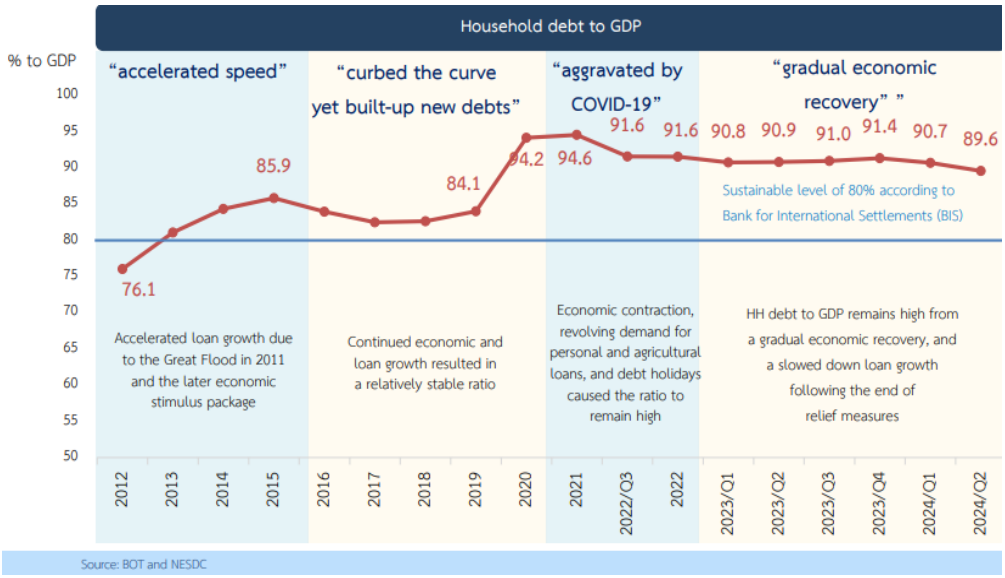
Source: https://www.nso.go.th/nsoweb/nso/statistics_and_indicators?impt_branch=309
Remark: Calculated Gini index please see Note from the source

The credit market plays a crucial role in Thailand, particularly in the modern financial system. As shown in Figure 1, the debt-to-GDP ratio in Thailand has amounted to almost 90% since COVID-19. Access to financial institutions allows businesses to invest and consumers to manage their consumption more efficiently. The development of an efficient financial system promotes economic growth by improving capital allocation, risk management, and the allocation of savings towards investment and consumption. In Thailand, data from the Bank of Thailand (2024) shows that loan accounts are distributed across various categories as follows: mortgages make up the largest share at 34%, followed by personal loans at 25%. Business loans account for 18%, while auto loans represent 11%. Other types of loans comprise 9%, and credit card loans constitute the smallest portion at 3%. This distribution highlights the significant demand for mortgages and personal loans, reflecting key financial priorities among borrowers

in Thailand. A significant portion of household debt stems from personal loans for consumption purposes, which do not contribute to productive output or generate future income.

Several studies have explored the relationship between rising income inequality and key macroeconomic variables. For example, Luchino and Morelli (2012), and Cingano (2014) examined the impact of income inequality on economic growth. Kim et al. (2014) explored the relationship between income inequality, savings, and aggregate consumption, while Krueger and Perri (2006) studied its effect on consumption inequality. Additionally, Russo et al. (2016) looked at the link between income inequality and financial instability. There is also substantial research focusing on income inequality and household debt levels, such as Klein (2015). Several empirical studies, including those by Christen and Morgan (2005) and Berisha et al. (2018), show a positive relationship between household debt and income inequality.

Figure 1 Thailand Household-Debt to-GDP



Source: https://www.bot.or.th/content/dam/bot/documents/en/news-and-media/news/2024/news-en-20241126.pdf

There are also theories related to income, consumption, and borrowing, such as the life cycle hypothesis and the permanent income hypothesis. The life cycle hypothesis is an economic theory that explains how individuals plan their consumption, savings, and spending behavior over their lifetime using their expected lifetime income rather than their current income. Similarly, the permanent income hypothesis developed by economist Milton Friedman in the 1950s (Friedman, 1957), states that people distinguish between permanent and transitory income. They plan their consumption based on their permanent income, as it reflects their ability to sustain a certain standard of living in the long run. Both hypotheses are grounded in classical economic theory, which emphasizes that household borrowing can facilitate more efficient allocation of consumption across different time periods. Those hypotheses provide interconnection between household income, borrowing, and consumption, indicating that consumption is influenced more by lifetime permanent income than by current income. Thus, when current income is not the primary determinant of consumption, rational consumers may borrow to bridge the gap between current income and consumption. Borrowing can be based on the income expected to be earned over one's lifetime, allowing consumers to plan their consumption in a way that maximizes utility throughout their life cycle. According to these assumptions, household debt impacts consumption through both income and substitution effects. The rise in household debt can be attributed to the widening gap between income and

consumption.

Empirical studies have found that low-income households exhibit a stronger relationship between household debt and income inequality (Iacoviello, 2008). Christen and Morgan (2005) also highlighted that rising income inequality in the United States contributes to increased household debt. This suggests that as the gap between income and consumption grows, households take on more borrowing to maintain their consumption levels, which in turn can dampen income growth.

Past studies have identified three main channels of the relationship between income inequality and household debt: 1. Higher inequality leads to an increase in the supply of money and availability of credit. As high-income groups tend to have a higher propensity to save, their increased savings contribute to a rise in investment in loanable funds markets (Kumhof et al., 2015); 2. Low-income households often maintain their living standards by borrowing money to meet their spending needs (Iacoviello, 2008); 3. As income inequality grows, households with low- and middle- incomes often face increasing pressure to maintain consumption levels that align with those of higher-income households. They are more likely to borrow in order to maintain consumption levels comparable to those of high-income households (Carr and Jayadev, 2015; Wildauer, 2016).

The life cycle theory and absolute income theory both examine the relationship between income and consumption. This study extends the prior literature to include income inequality, aiming to assess the relationship between income inequality, consumption, and debt. This is particularly relevant to Thailand, where rising household debt and persistent income inequality have been ongoing concerns for decades. Debt and income inequality are two of the most pressing economic issues in Thailand. Their interaction can provide insight into broader socioeconomic challenges, including financial instability and wealth concentration. Understanding this relationship is crucial for addressing these concerns. The study explores whether a relationship exists between these variables, emphasizing how this relationship might evolve over time, through the application of the Time-Varying Parameter Vector Autoregression (TVP-VAR) estimation technique.

2. LITERATURE REVIEW

Iacoviello (2008) examined the relationship between household debt and inequality using data from the U.S. Census spanning 1963–2003. The study found that the rise in income inequality during the 1980s and 1990s was a key factor driving higher levels of household debt and exacerbating wealth inequality. The research employed a quantitative dynamic model, which demonstrated that as income increased, wealthier households without borrowing constraints tended to increase their spending and use the additional income to pay down existing debt. In contrast, households facing borrowing constraints used their increased income to purchase more durable assets, which served as collateral for future borrowing and spending. Additionally, the model revealed that the correlation coefficient between debt and income for households without borrowing constraints was -0.28, while for households with borrowing constraints, it was 0.95. The negative correlation coefficient indicates that as income rises for households without borrowing constraints, their debt decreases. Conversely, households with borrowing constraints tend to accumulate more debt as their income increases.

Kumhof et al. (2015) investigated how changes in income distribution in the USA affected the rise in household debt and contributed to the financial crisis of 2008. The study found that the income share of high-income households rose significantly between 1982 and 2008, leading to a widening income disparity. At the same time, household borrowing among low- and middle-income earners also increased substantially.

Klein (2015) employed a cointegration approach to examine the long-term

interconnection between income inequality and household debt. The study found a significant long-term relationship between the two variables. In particular, a 1% rise in income inequality was correlated with a 2% to 6% increase in household borrowing or credit.

Belabed et al. (2018) analyzed the relationship between income inequality and household debt, focusing on the expenditure-based transmission mechanism. The study concluded, consistent with Wildauer (2016), that low-income households tend to reduce their savings to maintain consumption levels comparable to those of high-income households. This behavior creates pressure to increase spending, leading to rising debt levels among low-income households.

Bahadir (2020) demonstrated that rising income inequality leads to constraints on household borrowing. As a result, unexpected shocks in credit availability or borrowing conditions significantly impact household consumption, further exacerbating the expansion of income inequality.

Cheah et al. (2022) demonstrated that the correlation between inequality and household debt in Malaysia exhibits asymmetric characteristics in both the short and long term. Specifically, only a decrease in income inequality was found to have a significant positive impact on household debt, while an increase in income inequality did not show a statistically significant effect on household debt.

3. METHODOLOGY

To examine the short-term, medium-term, and long-term relationships between income inequality and household debt, this research employs the TVP-VAR model, following the approach of Piao et al. (2023). The TVP-VAR model is useful for capturing the time-varying nature of economic structures in a flexible and stable manner. By allowing for dynamic evolution of coefficients, the model can capture complex, evolving relationships that are often missed by traditional VAR models. Specifically, the estimated values can adapt to specific events, such as the onset of COVID-19, which impacted various economic variables. This model also allows for the analysis of phase-specific effects. The analysis begins with the SVAR model, as expressed in following equation

$$Ay_t = F_1 y_{t-1} + \cdots + F_j y_{t-j} + \varepsilon_t,\ t = j+1,\ldots,n\,.$$

The expression y_{t-1} , denotes a ($n \times 1$) dimensional variable which can be observed, A is a (k × k) dimensional joint parameter matrix, and $F_1, F_2, ...F_j$ is a (k × k) dimensional coefficient matrix. The perturbation term ε_t is a (k × 1) dimensional structural shock, with $\varepsilon_t \sim N(0, \sum\sum)$. $\sum$ is a diagonal array composed of standard deviations of the following form:

$$\sum = \begin{bmatrix} \sigma_1 & 0 & \cdots & 0 \\ 0 & \sigma_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_k \end{bmatrix}$$

Assuming the structural shock follows a recursive pattern, then the matrix A will be a lower triangular matrix, as shown:

$$A = \begin{bmatrix} 1 & 0 & \cdots & 0 \\ a_{21} & 1 & \cdots & 0 \\ \vdots & 0 & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & 1 \end{bmatrix}$$

Rearranging the model, we get:

$$y_t = B_1 y_{t-1} + \cdots + B_j y_{t-j} + A^{-1} \sum \varepsilon_t, \ \ \varepsilon_t \sim N\left(0, I_k\right),$$

where the matrix $B_i = A^{-1}F, i = 1, \ldots, j$, and β is defined by $X_t = I_j \otimes \left(y_{t-1}, \ldots, y_{t-j}\right)$ which is obtained from straightening each row element of the matrix *B*, and $\otimes$ is Kronecker product.

Consequently, the model takes the following form:

$$y_t = X_t \beta + A^{-1} \sum \varepsilon_t.$$

In case of time varying parameters, the model can be shown as the following:

$$y_t = X_t \beta_t + A_t^{-1} \sum_t \varepsilon_t,$$

Both the coefficients and, more importantly, the variance covariance matrix, are sources of changes over time, which causes unexpected changes over time in the matrix (shocks). Variance-covariance is also important in analyzing the behavior of the relationships between all variables in a system.

When parameter values can change over time, keeping the variance constant may lead to bias. To avoid misspecification problems, random variance is assigned to the TVP-VAR model, assuming that the variance can be expressed in logarithmic form as shown:

$$g_t = \left(g_{1t}, g_{2t}, g_{3t}, g_{4t}\right), \ g_{jt} = log\sigma_{jt}^2,$$

where $j = 1, \ldots, 4, t = p+1, \ldots, n.$

Assuming that all parameters are derived from a random process as follows:

$$\begin{aligned} \beta_{t+1} &= \beta_t + u_{\beta t}, \\ \alpha_{t+1} &= \alpha_t + u_{\alpha t}, \\ h_{t+1} &= h_t + u_{ht}, \end{aligned}$$

Additionally, it is assumed that the vector of innovations follows a normal distribution, with the covariance matrix as follows:

$$\begin{pmatrix} u_{\beta t} \\ u_{\alpha t} \\ u_{ht} \\ \varepsilon_t \end{pmatrix} \sim N\left[0, \begin{bmatrix} I & 0 & 0 & 0 \\ 0 & \sum \beta & 0 & 0 \\ 0 & 0 & \sum \alpha & 0 \\ 0 & 0 & 0 & \sum h \end{bmatrix}\right], t = j+1, \ldots n,$$

and

$$\beta_{p+1} \sim N\left(\mu_{\beta 0}, \Sigma_{\beta 0}\right),$$
$$\alpha_{p+1} \sim N\left(\mu_{\alpha 0}, \Sigma_{\alpha 0}\right),$$
$$h_{p+1} \sim N\left(\mu_{h 0}, \Sigma_{h 0}\right).$$

The disturbance terms associated with the time-varying parameters are uncorrelated. Additionally, $\Sigma_{\beta 0}, \Sigma_{\alpha 0}, \Sigma_{h 0}$ are diagonal matrices.

4. DATA

This study utilized annual data from 1980 to 2022, comprising a total of 43 observations. The data includes the Gini coefficient, a measure of income inequality, sourced from the World Inequality Database (WID). Thailand's household debt relative to GDP is indicated by the ratio of private sector credit, specifically domestic bank lending to the private sector, expressed as a percentage of GDP. The consumption-to-GDP ratio was derived from the final consumption expenditure of non-profit institutions serving households (NPISHs) as a percentage of GDP.

Given that the dataset in this research is annual, it is crucial to evaluate stationarity before conducting the Time-Varying Parameter Vector Autoregression (TVP-VAR) analysis, as this approach necessitates stationary data. To determine stationarity, the Augmented Dickey-Fuller (ADF) test was utilized, with the optimal lag length selected according to the Akaike Information Criterion (AIC).

Table 2 presents the ADF test results, showing the p-values across three different model specifications; individual effects, individual effects with trends, and no constant or trend. The findings suggest that, for the data in its original level form, we cannot reject the null hypothesis of a unit root in any model. As a result, the analysis was conducted again using the first differences of the dataset, yielding p-values below 0.05. This allows us to reject the null hypothesis with 95% confidence. This confirms that all variables are stationary at the first difference level. As a result, the first-difference form was be applied in the TVP-VAR estimation.

Table 2 Results of Stationary Testing

variables	level			1st diff		
	individual effects	individual effects and trends	none (no constant values or trends)	individual effects	individual effects and trends	none (no constant values or trends)
GINI	0.4173	0.1945	0.6060	0.0000**	0.0000**	0.0000**
DEBT	0.1101	0.3043	0.6333	0.0285**	0.0940*	0.0024**
CON	0.1254	0.8637	0.1379	0.0244**	0.0393**	0.0019**

Note: The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.
Source: Author

5. RESULTS

After estimating the model using TVP-VAR estimation, the coefficients were used to

generate the impulse response function. The results are presented in Figure 2. Figure 2.1 illustrates the response of household debt to a one standard deviation shock in the Gini coefficient, which measures income inequality. The impulse response graph demonstrates that an increase in income inequality leads to a reduction in household debt over various time horizons. The findings of this study differ from those of Christen and Morgan (2005), which are based on research from developed countries such as the USA. This is because, in developing countries such as Thailand, low-income households may face borrowing constraints from financial institutions. The dotted line shows the immediate response, indicating a short-term decrease in household debt. The dashed line represents a larger reduction in the medium term, occurring approximately four quarters (or one year) after the shock. Lastly, the solid line reflects the long-term response (three years), where the decline in household debt is the smallest compared to the short- and medium-term effects. These results suggest that although income inequality initially triggers a significant reduction in household debt, the impact gradually diminishes over time. In highly unequal societies, lower-income individuals may face stricter lending standards or higher interest rates, making it harder for them to borrow. This can lead to an overall reduction in household debt, even as inequality grows. Over the long term, households adjust their consumption patterns to adapt to higher inequality. They may reduce discretionary spending and focus on essential goods and services, which slows the pace of debt accumulation.

The response of household consumption to an increase in income inequality (Figure 2.2), varies across the short, medium, and long term. In the short term, when income disparities widen, household consumption tends to rise. However, in the medium and long term, consumption declines as income inequality grows. When income disparities increase, higher-income households may increase their consumption, particularly on luxury or non-durable goods. For lower-income households, if there is a desire to keep up with upper income households, according to the "Keeping up with the Joneses" concept, this leads to increased consumption and spending, which may result in informal debt to finance their expenses, as they face credit constraint problems. Such increases in consumption are only temporary and cannot be sustained. This is because low-income households are under financial stress from debt and other economic factors. The impact of increasing income inequality on reducing consumption in the medium and long term can be explained as follows. Rising income inequality can lead to economic inefficiency and hinder economic growth. Low-income households, facing reduced purchasing power, may weaken overall demand in the economy. Additionally, their limited ability to invest in education and healthcare results in a less productive workforce and slower long-term economic growth. As a consequence, consumption decreases.

Figure 2 Impulse Response Using TVP-VAR Estimation

Figure 2.1

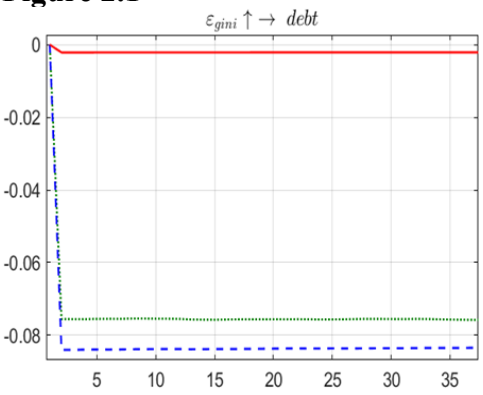


Figure 2.2

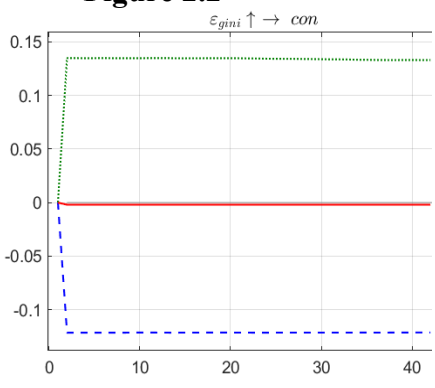
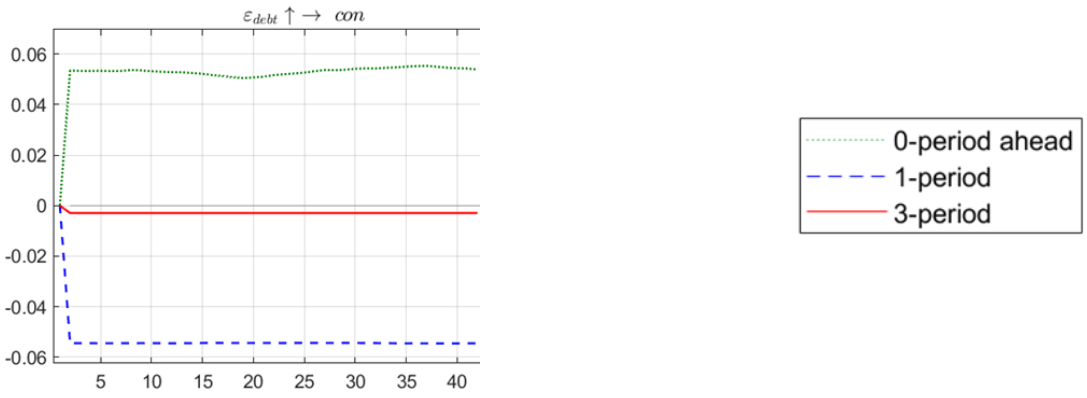


Figure 2.3



The response of household consumption to increases in debt varies across the short, medium, and long term (Figure 2.3). In the short term, a one standard deviation increase in debt leads to an immediate rise in consumption. This occurs because, as income inequality grows, low-income households with a higher propensity to consume often rely on borrowing to smooth consumption during periods of low income. However, in the long run, as income inequality widens, low-income households may face financial difficulties and struggle to meet debt obligations. This leads to a larger portion of their future income being allocated to debt repayment rather than spending on goods and services. As a result, consumption declines in both the medium and long term, with a more pronounced decrease in the medium term compared to the long term.

As the TVP-VAR model estimation method involves numerical experiments (simulations) with random sampling, this study employs the MCMC (Markov Chain Monte Carlo) statistical approach to ensure accurate parameter estimation. Additionally, the model uses annual data from 1980 to 2022, resulting in 43 observations, which may be considered insufficient for some analyses. To address this limitation and validate the results, the robustness of the model was tested through estimating the model using standard vector autoregression (VAR) methods and analyzing the impulse response functions, as shown in Figures 3.1-3.3. The results indicate that the responses of various variables in the standard VAR model align with those in the TVP-VAR model regarding immediate response

Figure 3 Impulse Response Using VAR Estimation

Figure 3.1

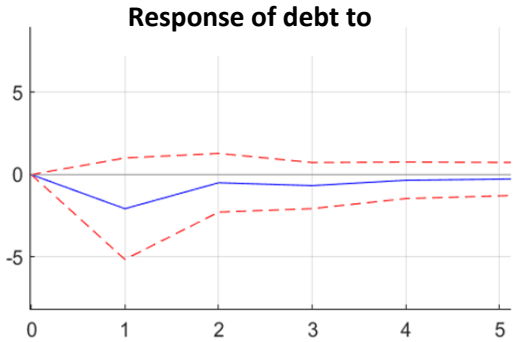


Figure 3.2

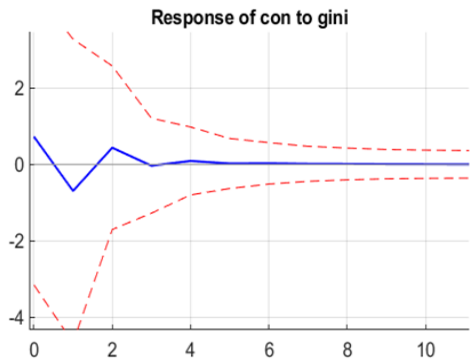
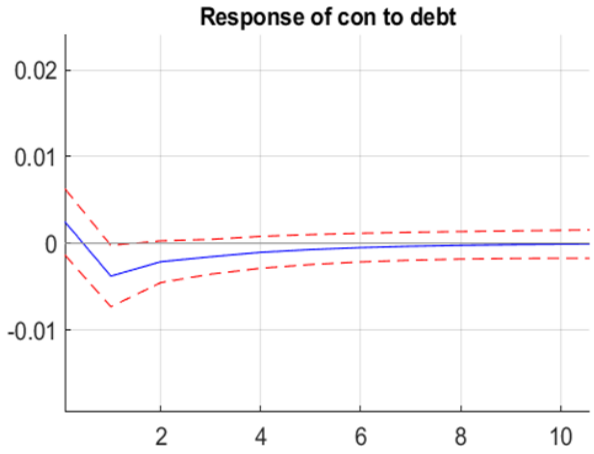


Figure 3.3



6. CONCLUSION AND RECOMMENDATIONS

This study examined the dynamic relationship between household debt, household consumption, and income inequality in Thailand from 1980 to 2022, using the income Gini coefficient as a measure of inequality. It explored the interactions between these variables and their economic implications, particularly regarding income disparity and debt accumulation. By analyzing how these relationships evolve over time, the study provides valuable insights for policy analysis. The dynamic analysis evaluates responses across various time horizons, specifically the short-term (0 quarters), medium-term (1 year), and long-term (3 years). The estimation technique employed was TVP-VAR.

The study found that an increase in income inequality leads to a reduction in household debt over various time horizons, which may be caused by the credit constraints faced by low-income households. Additionally, the study reveals that the effects of a debt shock on consumption vary across the short, medium, and long term. In the short term, an increase in the debt-to-GDP ratio boosts consumption. However, in the medium and long term, consumption decreases. The decline in consumption is more pronounced in the medium term than in the long term.

Based on these findings it is recommended that policy is used to address and reduce income inequality by improving access to financial resources for low-income households. One effective approach is to facilitate easier access to loans, particularly through initiatives that empower low-income individuals and communities. For instance, dedicated funds could be established to support small or community-based businesses, such as local cooperatives, or small-scale manufacturing units. Additionally, financial support mechanisms such as microfinance programs could be expanded, offering small loans with low interest rates and flexible repayment terms to help low-income households establish or grow their businesses. These measures would not only stimulate grassroots economic activity but also enable low-income households to generate sustainable income, reducing the income gap and promoting income equality and financial inclusion. Additionally, a system to record and store payment histories could be developed to generate credit scores, enabling low-income individuals to qualify for loans from financial institutions.

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