Dynamic Financial Management Behavior of Small-Scale Fisheries Community in the East Coast of Peninsular Malaysia: A System Simulation Approach

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Abstract. Small-scale fisheries (SSF) play in the global marine economy, especially in developing countries like Malaysia and provide significant employment opportunities and income for coastal communities. Despite their importance, small-scale fishing communities in Malaysia face several challenges of constant poverty risk and financial instability, particularly irregularity of income sources posing a significant challenge in the poverty eradication and socio-economic development of the fishermen. Indeed, irregular income significantly impacts consumption patterns, and indebtedness and which challenges household's savings capacity. Despite the implementation of government policies for the community's socio-economic development, the vicious cycle of poverty and financial instability among the small-scale fishery community still exists. The study focuses on evaluating the dynamic financial management behavior of small-scale fishery communities in the East Coast of Peninsular Malaysia. A system dynamics (SD) simulation approach is proposed to analyses the complex interactions and feedback mechanisms which influences household financial management of small-scale fishermen communities. The different scenarios with alternative financial management policies are analyzed using an SD simulation model to understand potential impacts on household financial and community resilience. Lastly, the study proposes the effective financial management policies as the possible policies for poverty eradication in SSF communities in Malaysia. The study will provide a comprehensive understanding of the financial management practices of Malaysia's small-scale fishing communities, benefiting not only the nation but also other countries facing similar challenges.

Keywords: Financial Management; system dynamics simulation model; small-scale fisheries, Malaysia

1 INTRODUCTION

Small-scale fisheries (SSF) play a vital in the global marine economy and are particularly significant in developing countries, especially in Malaysia. It provides critical employment and

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substantial fish catches thus underpinning food security for coastal and inland communities (Panghal et al., 2022; FAO, 2020; Loring et al., 2019). In Malaysia, small-scale fishing communities, which relies on basic equipment for subsistence, faces unfair competition from Illegal, Unreported, and Unregulated (IUU) operators, contributing to overfishing, reduced fish stocks, and heightened poverty and food security challenges (Teh & Pauly, 2018). Therefore, the financial vulnerability among small-scale fishing communities often exacerbates the problem. Combining small-scale fishing communities and financial instability, they amplify the impact of these challenges, making it harder for small-scale fishing communities to sustain themselves, invest in sustainable practices, or adapt to changing circumstances.

In addition, small-scale fishing communities are often faced with financial instability because of unpredictable weather, fluctuations in the price level of seafood prices, and also with limited financial services. All these factors will directly influence their economic well-being and impede their ability to invest, poor management during emergencies, and stabilize income. Thus, exacerbating broader socio-economic challenges in coastal regions. Unpredictable weather adversely affects small-scale fishermen's financial stability by disrupting productivity, leading to irregular incomes because changes in rainfall patterns and rising temperatures (Shaffril et al., 2017; Hadi et al., 2018). Besides that, the changes in consumer demand and environmental conditions will also cause seafood prices to fluctuate, directly affecting their income and ability to cover basic expenses. Due to their limited financial resilience and lack of other sources of income, they are often at risk of poverty or debt during economic shocks or crises, which exacerbates the situation. Furthermore, limited access to financial services restricts their capacity to save, invest, or obtain credit, thereby trapping them in poverty cycles and preventing necessary equipment upgrades or market adaptations (Pomeroy, 2020).

Fishing households often struggle to conduct effective financial management, which leads to debt, poverty and stress with potential implications for national economic stability (Setyoningrum, 2021). Indirectly, it contributes to the poverty of small fishing communities in developing countries, including Malaysia (Olale et al., 2012; Solaymani & Kari, 2014; Alemu & Azadi, 2018). Financial institutions are often reluctant to extend credit to small-scale fishers, especially for low and middle-income countries because perceived high risk in the occupations, increasing their vulnerability to external shocks and potential poverty traps (Jara et al., 2020).
Persistent poverty among traditional fishing communities reliant on small-scale fisheries persists despite efforts to alleviate it. Despite the vital role these communities play in global food security and economic stability, they continue to face significant challenges in achieving sustainable livelihoods and escaping poverty traps. The second problem is that small fishing communities face irregular income sources because they are often dependent on unpredictable factors that can greatly affect their income. Therefore, they face difficulties in saving and planning for the future, leading them to be more vulnerable to poverty. There is a worrying correlation between household income and consumption behaviour in Malaysia, with increased consumption leading to increased household indebtedness, thereby hampering their ability to save. However, some of the small-scale fishermen communities manage their finances effectively, balancing income, consumption, and savings, others struggle with poor financial management, leading to high levels of debt and financial instability. The government policies in Malaysia such as fiscal and monetary policies which can directly influence household financial management by affecting disposable

income and economic stability. In Malaysia, despite several papers implementing similar policies (Mele et al., 2020; Mohd Abdul Kadir et al., 2020; Chan et al., 2020), effective financial management remains a challenge, leading to persistent poverty issues.

The aim of this study was to assess the dynamic financial management behaviour of small fishing communities on the east coast of Peninsular Malaysia using a system dynamics simulation approach. In particular, the study will conduct a comprehensive survey of the factors that contribute to the persistence of poverty in small-scale fishing communities, examine the impact of financial instability arising from irregular sources of income on the overall socio-economic well-being of these small-scale fishing communities, explore the complex relationship between household income levels and their impact on consumption behaviour, debt and savings within small-scale fishing communities, assess system dynamics simulation's effectiveness in analysing and influencing financial behaviours in Malaysian households, and evaluates the impacts of government policies on household financial management within these small-scale communities.

2 LITERATURE REWIEW

2.1 Household Financial Vulnerability

Household financial vulnerability refers to the adverse financial position associated with the distress caused by liabilities. Several studies explore household financial vulnerability by using stress testing to assess responses to shocks (Leika & Marchettini, 2017; Sachin et al., 2018; Noerhidajati et al., 2021). For example, Leika and Marchettini (2017) assess the debt repayment capacity of Namibian households using Loan-to-Value and Debt-Service-to-Income ratios. Furthermore, they determine that Indian households usually borrow money for religious functions and farming operations, mainly impacting un-landed rural households (Sachin et al., 2018). In addition, Noerhidajati et al. (2021) examined the financial vulnerability of Indonesian households, revealing influences beyond income, including behavioural and socioeconomic factors. A number of empirical studies confirm that there is a significant correlation between household financial vulnerability (expressed by debt levels) and financial system stability. Dartanto and Shigeru (2016) show that the Asian Financial Crisis of 1997 heightened household sector vulnerability across Asia. Leika and Marchettini (2017) demonstrate that the impact of high household debt on financial system stability varies depending on country-specific characteristics and institutional frameworks.

2.2 Dynamic interactions between household income, consumption patterns, indebtedness, and savings

Malaysians have conducted extensive research on the complex interplay between household income, consumption patterns, indebtedness and savings. These studies have revealed correlations between income and consumption patterns (Ismail et al., 2021; Rashid et al., 2018; Mien & Said, 2018). Researchers have identified key expenditure components, including basic needs and luxury goods, shaping overall spending behaviours. These findings have implications for potential debt issues. Faced with a negative income shock, the behaviour of households with limited

financial assets tends to reduce consumption substantially, possibly one-to-one (Fagereng & Halvorsen, 2016). This phenomenon highlights the role of household indebtedness in the post-crisis decline in consumer spending, exacerbated by cyclical debt constraints, especially after debt-financed investment in durable goods.

Moreover, various studies investigating the relationship between household consumption and the composition of household debt in Malaysia have yielded differing results. Khan et al. (2016) found a causal relationship from consumption to debt, employing the Toda-Yamamoto non-causality test, consistent with the Life Cycle Model, suggesting that household's resort to borrowing to fund their consumption and expenses. Wong et al. (2023) used a Simultaneous Equations Model (SEM) to study household consumption and debt composition in Malaysia, revealing a negative correlation between consumption and indebtedness, with variations based on factors like household head's gender, urban or rural location, and income. They observed that Malaysia has a negative nexus between consumption and indebtedness (Murugasu et al., 2015). Conversely, Yunchao et al. (2020) argued that household debt does not generally influence spending decisions, except for high-debt households that spend less on vacations.

From a broader socioeconomic framework, household debt exacerbates income inequality and affects consumption patterns and community financial stability (Cheah et al., 2022). The relative income and inequality within reference groups persistently affect household consumption, even after controlling for absolute income and household characteristics (lbayrak, 2020). High debt levels may restrain the growth of household spending relative to income and assets, especially in households with higher debt (La Cava & Price, 2017; Price et al., 2019). When inequality is used as a reference group, household debt has a positive impact on household consumption, thus complicating the relationship between income, inequality, and saving behaviour. For example, several studies have been conducted to assess the ongoing impact of income fluctuations on mortgages and unsecured debt, respectively, suggesting that households are more reliant on consumption of debt than previously (Khan et al., 2016; Ma'in et al., 2021). This trend may indirectly reduce household savings, thus threatening their financial security.

2.3 Household financial management system: Factors and Determinants

Several theories and models including the (Life Cycle Hypothesis LCH) of Modigliani & Brumberg (1954), the Permanent Income hypothesis (PIH) of Friedman (1957), and the random walk model of Hall (1978) have contributed to the understanding of household financial management. In detail, LCH recommends that individuals plan their consumption and savings throughout their lives based on expected income and adjust their patterns as life stages change. Similarly, PIH assumes that the stable consumption of individuals is based on long-term income, emphasizing the role of stable income streams. Behavioural economics adds another layer, acknowledging psychological factors in financial decisions beyond rational calculations.
Hall (1978) and Campbell & Mankiw (1989) support both theories by pointing out that liquidity constraints also affect consumer behaviour. The consumption follows a random walk, especially in the short run, due to intertemporal optimization and smoothing (Hall, 1978). Under PIH, current income includes both permanent and temporary income, and consumption is mainly driven

by permanent income. In the rational expectations framework, changes in consumption are unpredictable and form the basis of the consumption random walk model.

Recent studies show that financial literacy and the behaviour is a key determinant of financial vulnerability, especially in Malaysia with high self-efficacy in the households (Fei, et al., 2022). The significant predictors of financial vulnerability include financial attitude, behaviour, and self-belief, with gender and income as notable control variables (Magli et al., 2020). Self-efficacy and psychological structure, as well as financial, attitude and behaviour have a positive effect on financial health (Sabri et al., 2022).

Moreover, research shows that financial vulnerability is influenced by multiple factors such as income level, marital status, age, education level and financial behaviour, and gender, race, income, number of dependents, age and education level also play an important role (Daud et al., 2019; Loke, 2017). In addition, younger individuals with lower education and poor money management skills are at higher risk of financial vulnerability, despite higher education and financial knowledge not always leading to improved financial management; those with low or seasonal incomes are particularly susceptible to financial distress.
In terms of financial literacy, most Malaysians show only moderate financial literacy (Mokhtar et al, 2018). Many fishermen in Malaysia have a limited understanding of financial management, which makes it difficult for them to make informed financial decisions. Due to a lack of financial literacy, these communities often have difficulty accessing credit facilities from microfinance institutions (Amenuku, 2018). This highlights the significant impact of demographic factors, financial literacy, attitude towards money, financial stress and financial ability on the overall financial situation (Sabri & Zakaria, 2015).

Regarding financial efficacy, Kusairi et al. (2020) explored household financial efficacy and its influence on consumption decisions, highlighting its significance alongside risk preferences and demographic factors and noted the pivotal roles of risk preferences, gender, and household location in determining consumption behaviour. The study emphasized that financial efficacy, in conjunction with financial literacy will affect consumption decisions and saving behaviour, particularly in choosing saving instruments (Kusairi et al., 2019). The factors such as race, education, and dependence ratio also contribute to saving instrument preferences, with households exhibiting higher financial efficacy favouring low-risk options like bank-based instruments

2.4 Concepts of System Dynamics (SD) Simulation modelling

System Dynamics (SD) provides a framework for modelling complex, dynamic systems, enhancing understanding and decision-making through philosophy and tools. It helps decision-makers analyse processes and comprehend intricate systems via iterative model testing and feedback analysis, serving as a policy modelling methodology grounded in decision-making principles and simulation (Richardson, 1996; Sterman, 1994; Drew, 1998). Terms such as feedback loops, exponential growth, goal seeking, and oscillation are concepts commonly associated with SD modelling which is a field that studies the behaviour of complex systems over time.

Feedback loops is crucial in SD (Richardson, 1992), as it explains how system structures lead to behaviour patterns through interconnected feedback loops that form cause-and-effect chains, influencing system dynamics alongside stock and flow structures, time delays, and non-linearities (Sterman, 2000). Two fundamental types of feedback loops exist: positive (self-reinforcing) loops and negative (balancing) loops. Positive loops, as the name implies, amplify the effect, causing it to grow exponentially, while negative loops work towards achieving an equilibrium state by progressively diminishing the gap between the current state of the system and the equilibrium state.

In addition, the term "exponential growth" originates from its association with a mathematical model that illustrates increasing growth systematically through a positive feedback loop (Kirkwood, 1998). However, the goal-seeking behaviour observed in systems involves a dynamic adjustment towards a predefined goal level, embodying a negative feedback loop striving for equilibrium (Sterman, 2000). Oscillation behaviour, the third fundamental mode of dynamic systems, arises from negative feedback loops causing continual overshooting and undershooting of the system's goal due to significant time delays in corrective actions (Sterman, 2000).

2.5 Existing studies using SD system simulation modelling

SD model has been widely used in various fields including economics and social science. For example, environmental science, public health, and business management, to understand complex system and dynamic interactions, for decision making and problem solving to provide valuable insights. The study utilizes SD modelling to enable researchers to model, analyse, and optimize relevant variables to facilitate understanding and promote effective strategies. The next section will focus in particular on the application of SD models to the fields of economics and social sciences.

In the field of economics, the changes in GDP growth exert the strongest influence on the sustainability of China's aircraft leasing industry when utilizing the SD theory for investigation (Lin et al., 2022). They suggested measures such as lowering financing costs and income tax rates, increasing investment in talent, and implementing risk control. Conversely, increasing the number of leasing firms has minimal impact on market share. Similarly, they demonstrate the utility of SD in evaluating metal mining investments, emphasizing the importance of selecting the right debt ratio for project profitability and accurately modelling future metal price paths (Savolainen et al., 2017). Furthermore, the effort dynamics and alternative management policies in the West Coast Zone B trawl fishery in Peninsular Malaysia were examined through a system simulation analysis to assess effort dynamics and industry performance (Sin et al., 2019). The findings show that a sustainable management policy for trawl fishing effort on the West Coast of Peninsular Malaysia was recommended, combining a 50% reduction in licenses issued in 2012, a decrease in fuel price subsidies, and an increase in landing charges.

In the social sciences, the SD-based dynamic Life cycle sustainability assessment (D-LCSA) framework captures the evolving characteristics of buildings and their interaction with sustainability indicators and the findings suggest that ignoring dynamic aspects leads to an underestimation of the overall sustainability impact by 50% and the specific environmental impact by 12%

(Francis & Thomas, 2022). Besides that, the proposed framework for dynamic modeling of dam and reservoir system functions under adverse conditions shows good applicability (Ivetić et al., 2022). It effectively identifies significant effects on performance and emphasizes the importance of dynamic failure modelling in comprehensive analysis. In addition to that, they focus on quantifying multi-parameter dynamic resilience in complex reservoir systems, with the Pirot reservoir system as a case study (Ignjatović et al., 2021). This approach offers insights beyond static measures, aiding in identifying vulnerable elements and representing overall system functionality decline.

Generally, previous studies that utilised SD modelling mostly focused on economic and social sciences. Hence, the research on system dynamic modelling in the field of financial management is very limited. This literature often delves into the complexity of economic systems, behavioural dynamics, and social interactions, providing valuable insights for a variety of interdisciplinary studies. However, research specifically focused on financial management may be less common in the context of system dynamics modelling, requiring more focused search strategies and possible interdisciplinary approaches to bridge the gap between financial theory and system dynamics approaches.

3 RESEARCH METHODOLOGY

3.1 Theoretical Framework

The consumption function is a statement of the general relation between the dependent variable, consumption expenditure and the various independent variables determining consumption such as current disposable income and income from previous periods and wealth. At low levels of disposable income households consume more than their current income, drawing on past saving, borrowing or selling assets to maintain consumption at some desired minimum income level (autonomous consumption). At higher levels of disposable income, they consume a part of their current income and save the rest.

According to the Keynes (1936) theory, there are three main factors which are disposable income, autonomous consumption (AC), and marginal propensity to consume (MPC) impacting on total household savings. Income levels are the primary determinant of consumption and savings. Higher incomes generally lead to higher consumption and savings, but the relationship is not necessarily linear. In addition, income affects consumption levels, but differences in consumer groups also affect consumption patterns, as different spending priorities and habits can significantly change how income is used. The relationship between income and consumption is depicted by the Marginal Propensity to Consume (MPC), which indicates how much consumption changes with a change in income.

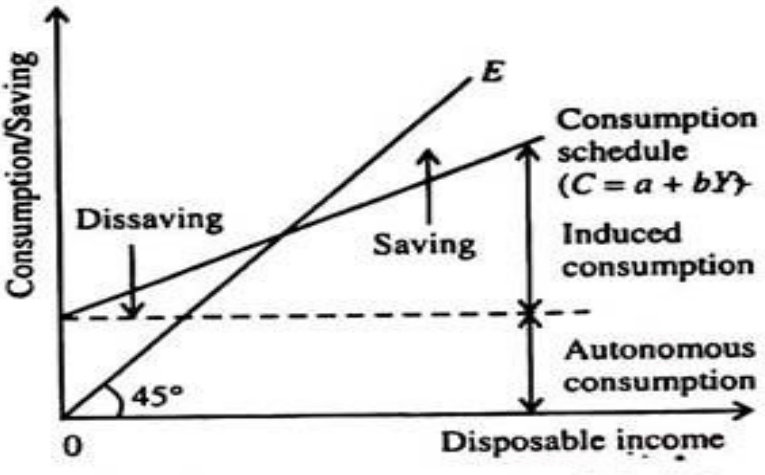

Fig 1. Keynesian Consumption and Saving Function

Consumption expenditure choices affect debt levels because overconsumption leads to borrowing. Indirectly, this affects saving behaviour because individuals are likely to spend more on repaying debt rather than saving for the future. Saving is the residual income after consumption and the marginal propensity to save (MPS) complements MPC and represents the fraction of additional income that is saved rather than spent.

Besides that, macroeconomic factors and government policies can influence the overall level of income sources. For instance, fiscal policies, including government spending and taxation, can impact aggregate demand. Price levels and inflation significantly affect household income by influencing both purchasing power and the real value of income. Therefore, both policies indirectly affect consumption and saving behaviour. Generally, the theoretical framework of financial management behaviours within household can be illustrated as Figure 2.

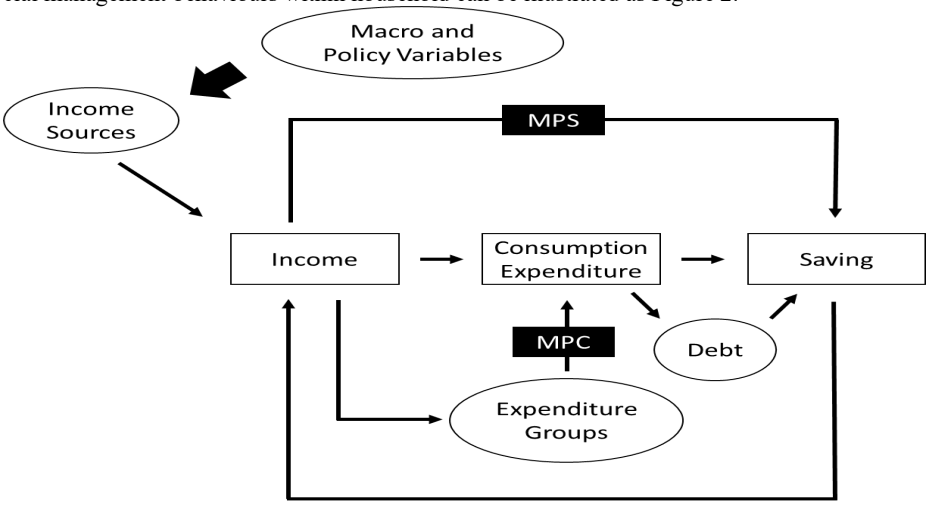

Fig 2. Financial management behaviours within household (Keynes Theory).

Household income consists of all receipts whether monetary or in kind (goods and services) that are received by the household or by individual members of the household at annual or more frequent intervals but excludes windfall gains and other such irregular and typically one-time receipts (ILO, 2004). In addition, household income encompasses the pre-tax earnings of the householder, and all individuals aged 15 and older in the household, regardless of their relationship to the householder, reflecting the total income from all sources within the household (Guzman, 2022).

Household income spent on consumption and saving is often referred to as disposable income. Disposable personal income (DPI) "represents an individual's after-tax income, which can be used for personal consumption or savings (Kinghorn, 2007). Household disposable income (HDI) is a household's total income after taxes and mandatory payments are deducted, excluding non-monetary transfers such as health and education services (OECD, 2020). Thus, total household disposable income (THDI) is the sum of disposable income from a household's various sources of income, as shown in equation (1). According to Keynes (1936), household disposable income (HDI) is defined as the sum of household consumption expenditure (HCE) and household savings (HS), as shown in equation (2).

$$THDI_t = \sum_{i=1}^{n} HDI_{i,t} \qquad (1)$$

Where, $THDI_t$ is total household disposable income at time t; HDI_t is the household disposable income at time t; i denotes income sources, and n denotes number of income sources for household.

$$HDI_{i,t} = HCE_t + HS_t \qquad (2)$$

Where, HCE_t is household consumption expenditure at time t and HS_t is the household savings at time t.

Household Consumption Expenditure refers to household consumption spending on goods and services, including those acquired through direct money purchases, production for their own accounts, barter transactions, or in-kind income to meet the needs of their members (DOSM, 2020). Household non-consumption expenditures are financial services, other expenditures and government expenditures that increase national income which means that the payment has no return or benefit. It is including income tax, social insurance, compensation, compulsory fees and fines, gifts to other families, repayment of housing, car, investment and other transfer expenditures. The sum of household consumption expenditure and non-consumption expenditure constitutes the total current household expenditure. Thus, the total household consumption expenditure (THCE) equals the sum of the household consumption expenditure from various expenditure groups, as expressed in Equation (3).

$$THCE_t = \sum_{j=1}^{n} HCE_{j,t} \qquad (3)$$

Where, $THCE_t$ is the total household consumption expenditure at time t; j denotes consumption expenditure, and n denotes number of expenditure groups for household.

Keynes's (1936) fundamental concept revolved around the notion that, as income rises, both the MPC and the average propensity to consume (APC) decline. The Keynesian consumption function relies on three key elements: disposable income, autonomous consumption, and the MPC. Therefore, the consumption function can also be expressed as equation (4), where

household consumption expenditure (HCE) equals the sum of autonomous consumption (AC), the marginal propensity to consume (MPC), and disposable personal income (DPI).

$$HCE_t = AC_{j,t} + MPC_{j,t}(DPI_{j,t}) \quad (4)$$

Where, AC_t is the autonomous consumption at time t; MPC_t represented marginal propensity to consume at time t and DPI_t is the disposable personal income at time t.

However, the ratio of the change in household consumption expenditure (ΔHCE) to the change in disposable personal income (ΔDPI) is the MPC. Thus, the MPC can be expressed as equation (5). The disposable personal income (DPI) refers to a personal income (PI) after taxes and is available for personal consumption or savings. Therefore, it can be expressed as below:

$$MPC_{j,t} = \frac{\Delta HCE_{j,t}}{\Delta DPI_t} \quad (5)$$

$$DPI_t = PI_t - Tax_t \quad (6)$$

Where, ΔHCE_t is the change in household consumption expenditure at time t; ΔPDI_t represented the change in disposable personal income at time t; PI_t is the personal income at time t and Tax_t denoted taxes at time t.

Moreover, the household savings equation represents the relationship between disposable personal income, consumption, and savings for an individual or a household (Keynes, 1936). The total household saving (THS) is calculated as the total household disposable income minus the total household consumption expenditure, as shown in equation (7).

$$THS_t = THDI_t - THCE_t \quad (7)$$

Where, THS_t is the total household saving at time t.

Furthermore, household debt refers to the total financial obligations of households, including nonprofits that serve them, to repay interest or principal to creditors at a specific future date (OECD, 2024). There are various types of common household debt such as consumer debt, mortgage debt, and other debt (BNM, 2014). Besides that, the Miscellaneous Expenditure (ME) also known as household debt such as Credit Card Payment (CCP), Personal Loans (PL), Vehicle Loans (VL), and Property Loans (PrL). Therefore, the total household debt can be expressed as equation (8).

$$THD_t = CCpayment_t + PL_t + VL_t + PrL_t \quad (8)$$

Where, THD_t is the total household debt at time t; $CCpayment$ is the credit card payment at time t; PL_t is the personal loans at time t; VL_t represented vehicle loans at time t, and PrL_t is the property loans at time t.

3.2 Conceptual Framework

According to the theoretical framework, this study incorporates three main variables: Total Generated Disposable Household Income (TGDHI), Total Household Consumption Expenditure (THCE), and Total Household Savings (THS). These three main variables will affect by many factors such as Generated Income Sources (GIS), Consumption Expenditure (CE), Miscellaneous Expenditure (ME), Government Management Policy (GMP), and Government Macro Policy (GMaP).

First, the TGHDI represents the total income available to households after taxes have been paid and government transfers have been received. It is the income that households can use for spending or saving. Then, households can decide how much of their disposable income to allocate to consumption expenditure (THCE) and how much to save (THS). Thus, this decision is crucial because it balances current consumption with future financial security.

THCE will be influenced primarily by TGHDI because they represent the available funds utilized in purchasing goods and services. When TGHDI rises, household purchasing power tends to increase, leading to an increase in THCE because households can afford more goods and services. Besides that, the TGHDI is influenced by the GIS component of household income, is subject to the effects of GMP aimed at shaping economic conditions. These policies may include tax regulations, subsidies, and other economic incentives that influence the overall income generation within households.

On the expenditure side, THCE is comprised of CE and ME, and these categories are susceptible to the influence of government policy. For instance, government management policy such as stimulus packages or austerity measures can directly impact consumption patterns, affecting the amount households spend on goods and services. Furthermore, miscellaneous expenditures (ME), encompassing a wide range of non-essential expenses, can also be influenced by government macroeconomic policies that affect the overall economic landscape. macroeconomic variables such as interest rates, inflation and so forth have an impact on the affordability and availability of certain ME.

In conclusion, Figure 3 shows how household income, consumption and savings relate with sources of generated incomes, government policies in line with the Financial Dynamics Conceptual Framework.

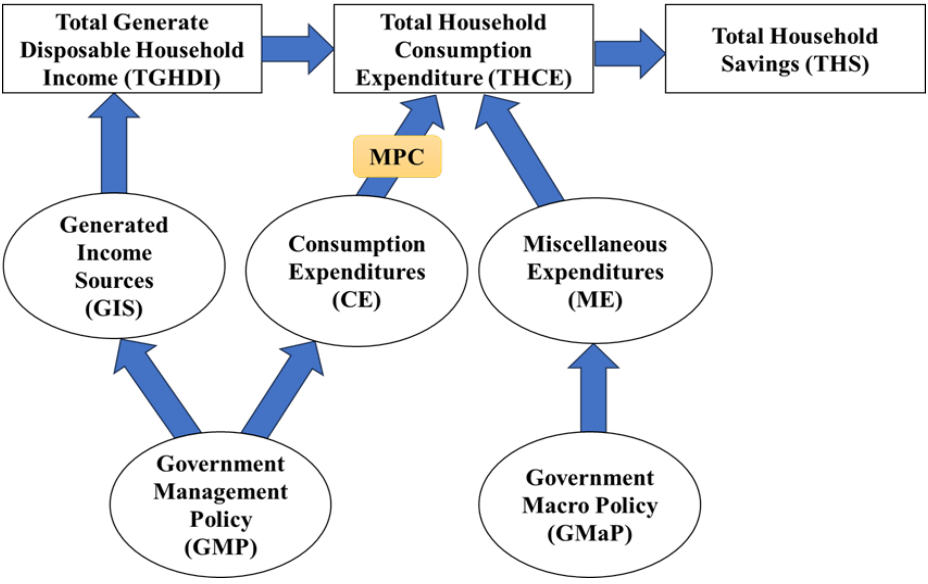

Fig 3. Conceptual Framework of the Financial Dynamics Model

3.3 Research Model Development – System Simulation Model

The financial dynamics of a specific economic framework are examined through the System Simulation model in this study. The model consists of three key modules that target different areas of the system: the Income Generation Module, the Consumption Expenditure Module, and the Policy Module. It is generally thought that this comprehensive framework supplies a powerful instrument for economic analysis and decision-making as it helps to explore the links between income generation, consumer spending, and policy interventions.

Simulation models depend on key variables called parameters which describe the characteristics and behaviour of the system. It is also critical to calibrate simulation model to accurately reflect real-world conditions. They allow researchers to test various scenarios, analyse the potential effects of different factors, and draw meaningful conclusions about economic dynamics. Based on the three modules, the simulation model of the dynamic financial management behaviour of small-scale fisheries community in the east coast of peninsular Malaysia as shown in Figure 4.

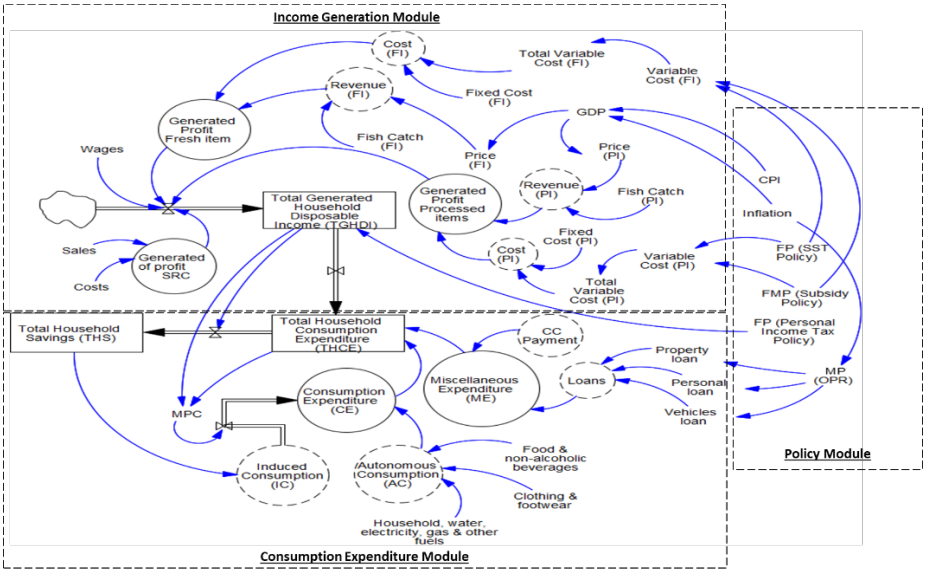

Fig 4. System Simulation model of dynamic financial management behaviour of Small-scale fisheries community

4 RESULT

Generally, the study will provide a comprehensive understanding of the financial management practices of the small-scale fishermen's community in the East coast of Peninsular Malaysia. The SD simulation modelling is useful in testing multiple policy interventions which are evidence-based and recommendation on ways to enhance financial situation of the small-scale fisherman households. In detail, the study will delve into the economies of these households, such as their sources of income, spending patterns, borrowings and savings. Understanding these dynamics will serve as a benchmark for establishing their financial health status as well as areas requiring improvement.

By analysing data from small-scale fisher households will allow for the identification of the major financial problems they encounter including instability in income; spending behaviour; limited access to financial services and high levels of indebtedness.Using an SD simulation model, this study will evaluate the potential impact of various policy interventions on the financial situation of small-scale fishing households. These communities can be empowered through such measures, which may include support policies such as subsidies, taxes, and financial literacy programs, to ensure they

have sufficient information to make sound financial decisions. Simulation models will evaluate alternative scenarios to anticipate consequences and assist decision-makers in making informed decisions.

5 CONCLUSION AND RECOMMENDATION

The proposed study aims to contribute to the development of effective policies to improve the financial management of the small-scale fishermen's community in the East coast of Peninsular Malaysia. The use of SD simulation modelling provides a unique opportunity to test different policy interventions and evaluate their effectiveness, leading to evidence-based recommendations. The findings of this study will be valuable not only for the East coast of Peninsular Malaysia, but also for whole Malaysia and other countries facing similar challenges in managing the financial situation of their fisherman communities.

REFERENCES

1. Albayrak, Ö. (2020). Household consumption, household indebtedness, and inequality in Turkey: A microeconometric analysis. Levy Economics institute, Working Papers Series.
2. Alemu, A. E., & Azadi, H. (2018). Fish value chain and its impact on rural households' income: Lessons learned from Northern Ethiopia. Sustainability, 10(10), 3759. https://doi.org/10.3390/su10103759
3. Amenuku, M. A. (2018). Financial literacy, microfinance, and performance of artisanal fishermen in Elmina fishing community (Doctoral dissertation, University of Cape Coast).
4. BNM. (2014). Bank Negara Malaysia Annual Report 2013. Kuala Lumpur: Bank Negara Malaysia, March, 1–160.
5. Campbell, J. Y., & Mankiw, N. G. (1989). Consumption, income, and interest rates: Reinterpreting the time series evidence. NBER macroeconomics annual, 4, 185-216.
6. Chan, L. M., Koay, Y. Y., Keh, C. G., Tang, S. E., & Tan, Y. T. (2020). Can the" Tax the Rich, Subsidise the Poor" Policy Improve Financial Satisfaction among Malaysians?. International Journal of Management Studies, 27(1), 21-47.
7. Cheah, S. P., Lau, L. S., & Choong, C. K. (2022). Income Inequality and Household Debt in Malaysia: Is There an Asymmetric Relationship?. International Journal of Economics & Management, 16(1).
8. Daud, S. N. M., Marzuki, A., Ahmad, N., & Kefeli, Z. (2019). Financial vulnerability and its determinants: Survey evidence from Malaysian households. Emerging Markets Finance and Trade, 55(9), 1991-2003.
9. DOSM. (2020). Household Expenditure Survey Report 2019. Department of Statistics Malaysia, 266. https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=323&bul_id=WnZvZWNVeDYxKzJjZ3RlUVVYU2s2Zz09&menu_id=amVoWU54UTl0a21NWmdhMjFMMWcyZz09
10. Drew, D.R. (1998). System Dynamics: Modeling and Applications. Blacksburg, VA, USA: Virginia Tech University Printing Services.
11. Fagereng, A., & Halvorsen, E. (2016). Debt and household consumption responses. Available at SSRN 2942502. https://doi.org/10.2139/ssrn.2942502

12. FAO (2020). The State of World Fisheries and Aquaculture 2020: Sustainability in action. https://doi.org/10.4060/ca9229en
13. Fei, C. K., Sabri, M. F., Rahim, H. A., & Othman, M. A. (2022). Determinants of Financial Vulnerability Among Credit Counseling and Debt Management Agency Customers. Malaysian Journal of Consumer and Family Economics, 28(June), 33–67.
14. Francis, A., & Thomas, A. (2022). A framework for dynamic life cycle sustainability assessment and policy analysis of built environment through a system dynamics approach. Sustainable Cities and Society, 76, 103521.
15. Friedman, M. (1957). Theory of the consumption function. Princeton university press.
16. Guzman, G. (2022). Household income: 2021. American Community Survey Briefs.
17. Hadi, S. P., Suryoko, S., & Prabawani, B. (2018). The Irony of Fishermen Life in Bontang Islands, East Kalimantan, Indonesia. E3S Web of Conferences, 73, 3–5. https://doi.org/10.1051/e3sconf/20187304025
18. Hall, R. E. (1978). Stochastic implications of the life cycle-permanent income hypothesis: theory and evidence. Journal of political economy, 86(6), 971-987.
19. Ignjatović, L., Stojković, M., Ivetić, D., Milašinović, M., & Milivojević, N. (2021). Quantifying multi-parameter dynamic resilience for complex reservoir systems using failure simulations: case study of the pirot reservoir system. Water, 13(22), 3157.
20. ILO (2004). Resolution 1: Resolution Concerning Household Income and Expenditure Statistics, adopted at the 17th International Conference of Labour Statisticians, December. Geneva. Available from https://www.ilo.org/public/english/bureau/stat/download/articles/2004-1.pdf
21. Ismail, M. K., Kumaran, V. V., Munawwarah, S. N., Muhamad, M. Z., & Sarifuddin, S. (2021). COVID-19 outbreak: an analysis of Malaysian household income class during movement control order (MCO). Studies of Applied Economics, 39(4).
22. Ivetić, D., Milašinović, M., Stojković, M., Šotić, A., Charbonnier, N., & Milivojević, N. (2022). Framework for dynamic modelling of the dam and reservoir system reduced functionality in adverse operating conditions. Water, 14(10), 1549.
23. Jara, H. J., Tam, J., Reguero, B. G., Ganoza, F., Castillo, G., Romero, C. Y., Gévaudan, M., & Sánchez, A. A. (2020). Current and future socio-ecological vulnerability and adaptation of artisanal fisheries communities in Peru, the case of the Huaura province. Marine Policy, 119(July 2019). https://doi.org/10.1016/j.marpol.2020.104003
24. Keynes, J. M. (1936). The General Theory of Employment, Interest and Money. London: Macmillan.
25. Khan, H. H. A., Abdullah, H., & Samsudin, S. (2016). Modelling the determinants of Malaysian household debt. International Journal of Economics and Financial Issues, 6(4), 1468-1473.
26. Khan, H. H. A., Abdullah, H., & Samsudin, S. (2016). The linkages between household consumption and household debt composition in Malaysia. International Journal of Economics and Financial Issues, 6(4), 1354-1359.
27. Kinghorn, M. (2007). Key aspects of per capita personal income. Indiana Business Review, 82(1), 6.
28. Kirkwood, C. W. (1998). System dynamics methods: A quick introduction. College of Business, Arizona State University, 126.
29. Kusairi, S., Sanusi, N. A., Muhamad, S., Shukri, M., & Zamri, N. (2020). Linkages of financial efficacy, demographics, risks preference and consumption behavior in Malaysia. The Journal of Asian Finance, Economics and Business (JAFEB), 7(9), 673-685.
30. Kusairi, S., Sanusi, N. A., Muhamad, S., Shukri, M., & Zamri, N. (2019). Financial households' efficacy, risk preference, and saving behaviour: lessons from lower-income households In Malaysia. Economics & Sociology, 12(2), 301-318.

31. La Cava, G., & Price, F. (2017). The effect of higher household debt levels on spending behavior in in Australia. In Paper for RBNZ Conference "Housing, Household Debt and Policy.
32. Leika, M., & Marchettini, D. (2017). A generalized framework for the assessment of household financial vulnerability. International Monetary Fund.
33. Lin, W., Lu, J., Zhu, J., & Xu, L. (2022). Research on the sustainable development and dynamic capabilities of China's aircraft leasing industry based on system dynamics theory. Sustainability, 14(3), 1806.
34. Loke, Y. J. (2017). Financial vulnerability of working adults in Malaysia. Contemporary Economics, 11(2), 205-218.
35. Loring, P. A., Fazzino, D. V., Agapito, M., Chuenpagdee, R., Gannon, G., & Isaacs, M. (2019). Fish and food security in small-scale fisheries. Transdisciplinarity for small-scale fisheries governance: analysis and practice, 55-73. https://doi.org/10.1007/978-3-319-94938-3_4.
36. Ma'in, M., Hussin, N. F., Muda, R., & Mat Isa, S. S. (2021). Unsecured loan household debt in malaysia. Malaysian Journal of Consumer and Family Economics, 26, 251–272.
37. Magli, A. S., Sabri, M. F., & Rahim, H. A. (2020). The influence of financial attitude, financial behaviour, and self-belief towards financial vulnerability among public employees in Malaysia. Malaysian Journal of Consumer and Family Economics, 25, 175-193.
38. Mele, M., Quarto, A., & Abbafati, C. (2020). On the Fiscal Policy in Malaysia: An Econometrical Analysis Between the Revenue–and Expenditure. Research in World Economy, 11(1), 1.
39. Mien, T. S., & Said, R. (2018). A cross-sectional household analysis of household consumption patterns: An indirect approach to identify the possible factors of personal bankruptcy. Jurnal Ekonomi Malaysia, 52(3), 245–261. https://doi.org/10.17576/JEM-2018-5203-18
40. Modigliani, F., & Brumberg, R. (1954). Utility analysis and the consumption function: An interpretation of cross-section data. Franco Modigliani, 1(1), 388-436.
41. Mohd Abdul Kadir, J., Gulam Hassan, M. A., & Yusof, Z. (2020). Sectoral responses, macroeconomic impact and household welfare: GST Policy for Malaysia economy. Jurnal Intelek, 15(1), 21-39.
42. Mokhtar, N., Sabri, M. F., Catherine, S. F., Thinagaran, M. D., & Dass, L. M. (2018). Profile and differences in financial literacy: Empirical evidence. Malaysian Journal of Consumer and Family Economics, 21, 164-185.
43. Murugasu, D., Huei, C. W., & Hwa, T. B. (2015). Implications of evolving household balance sheets for private consumption in Malaysia. Bank Negara Malaysia Working Papers, WP7/2015. p1-25.
44. Noerhidajati, S., Purwoko, A. B., Werdaningtyas, H., Kamil, A. I., & Dartanto, T. (2021). Household financial vulnerability in Indonesia: Measurement and determinants. Economic Modelling, 96, 433-444.
45. OECD. (2024), Household debt (indicator). doi: 10.1787/f03b6469-en (Accessed on 07 February 2024).
46. OECD. (2024), Household disposable income (indicator). doi: 10.1787/dd50eddd-en (Accessed on 07 February 2024).
47. Olale, E., & Henson, S. (2012). Determinants of income diversification among fishing communities in Western Kenya. Fisheries Research, 125, 235-242. https://doi.org/10.1016/j.fishres.2012.02.029
48. Panghal, A., Mor, R. S., Kamble, S. S., Khan, S. A. R., Kumar, D., & Soni, G. (2022). Global food security post COVID-19: Dearth or dwell in the developing world? Agronomy Journal, 114(1), 878–884. https://doi.org/10.1002/agj2.20932

49. Pomeroy, R., Arango, C., Lomboy, C. G., & Box, S. (2020). Financial inclusion to build economic resilience in small-scale fisheries. Marine policy, 118, 103982.
50. Price, F., Beckers, B., & La Cava, G. (2019). The effect of mortgage debt on consumer spending: evidence from household-level data. Sydney, NSW: Reserve Bank of Australia.
51. Rashid, N. K. A., Sulaiman, N. F. C., & Rahizal, N. A. (2018). Survivability through Basic Needs Consumption among Muslim Households B40, M40 and T20 Income Groups. Pertanika Journal of Social Sciences & Humanities, 26(2).
52. Richardson, G. P. (1996). Problems for the future of system dynamics. System Dynamics Review: The Journal of the System Dynamics Society, 12(2), 141-157.
53. Richardson, G.P. (1992). Feedback thought in social science and systems theory. System Dynamics Review, 8(1), 105–107.
54. Sabri, M. F., & Zakaria, N. F. (2015). The Influence of Financial Literacy, Money Attitude, Financial Strain and Financial Capability on Young Employees' Financial Well-being. Pertanika Journal of Social Sciences & Humanities, 23(4).
55. Sabri, M. F., Wijekoon, R., Burhan, N. A. S., Rahim, H. A., Othman, M. A., & Magli, A. S. (2022). The antecedents of financial health in Malaysia with the mediating effect of financial vulnerability. Malaysian Journal of Consumer and Family Economics, 28, 100-129.
56. Sachin, B. S., Rajashekar, V., & Ramesh, B. (2018). Festival spending pattern: its impact on financial vulnerability of rural households. Social Work Foot Print, 7(5), 48-57.
57. Savolainen, J., Collan, M., & Luukka, P. (2017). Analyzing operational real options in metal mining investments with a system dynamic model. The Engineering Economist, 62(1), 54-72.
58. Setyoningrum, A. A. D. (2021). The Influence of Financial Management on Family Economy. KnE Social Sciences, 5(7), 1–12. https://doi.org/10.18502/kss.v5i7.9314
59. Shaffril, H. A. M., Samah, A. A., & D'Silva, J. L. (2017). Adapting towards climate change impacts: Strategies for small-scale fishermen in Malaysia. Marine Policy, 81, 196-201.
60. Sin, M. S., Yew, T. S., & Noh, K. M. (2019). Effort dynamics and alternative management policies: The case of the west coast zone B trawl fishery in peninsular Malaysia. Marine Resource Economics, 34(1), 77-103.
61. Solaymani, S., & Kari, F. (2014). Poverty evaluation in the Malaysian fishery community. Ocean & Coastal Management, 95, 165-175. https://doi.org/10.1016/j.ocecoaman.2014.04.017
62. Sterman, J. D. (1994). Learning in and about complex systems. System dynamics review, 10(2-3), 291-330.
63. Sterman, J. D. (2000). Business dynamics: Systems thinking and modeling for a complex world, McGraw-Hill, New York.
64. Teh, L. C., & Pauly, D. (2018). Who brings in the fish? The relative contribution of small-scale and industrial fisheries to food security in Southeast Asia. Frontiers in Marine Science, 5, 44.
65. Wong, Z. Y., Kusairi, S., & Halim, Z. A. (2022). The nexus between households' indebtedness and consumption: the role of gender, geographical area and income groups. International Journal of Development Issues, 22(1), 72-90.
66. Yunchao, C., Yusof, S. A., Amin, R. M., & Arshad, M. (2020). Household debt and household spending behavior: Evidence from malaysia. Jurnal Ekonomi Malaysia, 54(1), 111-120.